



सत्यमेव जयते

भारत सरकार/ GOVERNMENT OF INDIA

पोत परिवहन मंत्रालय/ MINISTRY OF SHIPPING

नौवहन महानिदेशालय/ DIRECTORATE GENERAL OF SHIPPING

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No.45-Admn(1)2016

3rd March, 2017

Subject: - **Quotations for Annual Maintenance Contract for e-Pariksha computer based examination system for Marine Engineer Officer [MEO] -Class IV, in the Directorate General of Shipping, Mumbai**

Sealed quotations from leading service providers are invited for, appointing the **Annual Maintenance Contractor [AMC] for maintenance, question authoring, support and PM services for e-Pariksha computer based examination system for MEO Class IV, in the Directorate General of Shipping, Mumbai**, initially for a period of 1(one) year which may be further extendable for another one year.

2.SCOPE OF WORK :

A. Background

DG Shipping (DGS) has designed and developed the ePariksha computer based examination system for Marine Engineer Officer Class IV. The first phase of development work on this has been completed and the system has been deployed and rolled out in June 2012. Through this tender, DGS seeks to engage a vender to provide a set of services to help their team operate and enhance the ePariksha system for the MEO IV examinations during the period.

B. Overview of Services

The services sought from the Contractor w.r.t. the ePariksha system involve the following:

- Software Maintenance & Upgrades
- Deployment and Technical Support services
- Customer Support services
- Question Authoring services
- Project Management and Consulting services
- Server Hosting (through partnership with C-DAC)
- Exam Centre Infrastructure services (through partnership with Third party)

C. Scope

The scope of this proposal is limited to providing a collection of services outlined below in order to help DGS and the various Mercantile Marine Departments (MMDs) to successfully operate and enhance the ePariksha system over a period of time. It is to be noted that this tender only covers the set of services required for the conduct of the MEO IV exams.

D. Deliverables

Contractor shall provide a set of services (for the specified number of hours) as outlined below:

I. Software Maintenance & Upgrades:

Contractor shall provide support for software maintenance and upgrades of ePariksha. The following activities will be performed:

- a. Conducting scheduled maintenance of the system on a monthly basis.
- b. Conducting scheduled maintenance of the examination tablets worthiness in a six monthly basis
- c. Providing bug fixes for any software bugs identified in the ePariksha system.
- d. Incorporating minor change requests identified by the Customer team.

The current technology stack, network architecture etc are included as annexures to this document.

II. Technical Support Services:

Contractor shall provide Technical Support services for the MEO IV exams. A team will be available for on a 1 FTE basis for handling Technical support for MEO IV exams during the term of this tender. Contractor shall provide Technical support services over phone/Internet/onsite to handle:

- a. Technical issues raised by Candidates when using the CREBS module
- b. Technical issues raised by team at Customer and MMDs when using the various modules

III. Customer Support Services:

Contractor shall provide Customer support services over phone/email/Internet to handle non-technical issues raised by Candidates for MEO IV exams when using the CREBS module. The customer support team will be available on a 3 FTE during the term of this SOW.

IV. Question Authoring Services:

Contractor shall provide Question Authoring services to enhance the ePariksha question bank for the MEO IV exams. The Contractor shall provide 15,000 questions (5,000 per year) for the MEO IV exams during the term of the tender.

- a. Customer will identify the domain experts who will author the questions
- b. Contractor will work with domain experts identified by Customer to get questions created and verified for appropriateness for the grade of examination.
- c. Contractor will perform required de-duplication of questions as applicable.
- d. Contractor will enter these questions into the ePariksha system after approval.

V. Project Management and Consulting Services:

Contractor shall assign a Project Manager (PM) and a team of Consultants to provide the following services:

- a. PM will manage the Software maintenance and upgrades.
- b. PM shall manage the Technical and Customer support teams to ensure that all technical and customer support requests (tickets) are attended to based on priority and within acceptable time periods.
- c. PM will manage the question authoring project to ensure that questions are authored, quality assured and entered into the system in a timely manner.
 - PM will coordinate with the team of domain experts (external and internal to Contractor) to develop questions for the MEO IV exam.
 - PM will manage the process of review of these questions by DGS.
 - PM will manage the subsequent entry of these questions into the ePariksha system.
- d. The PM and the team of Consultants will provide recommendations to the Customer on how the ePariksha system and the related internal processes can be enhanced over time.

VI. Hosting Services for DGS Central Servers

Customer has partnered with C-DAC for the hosting infrastructure (servers, bandwidth, backup, etc.) for the Central DGS server cluster. Contractor will partner with C-DAC to provide a hosting solution for the Central DGS servers to support the MEO IV exams during term of this SOW.

VII. Exam Conducting Services

Contractor would provide the following services towards smooth conduct of examinations through the duration of the tender

1. Initiating of booking process by duly intimating the dates of exams on the ePariksha website.
2. Accepting new candidate registration and exam slot booking through the ePariksha system.

3. Provide priority 1 support during the conduct of the exam to the exam center partner and candidates.
4. Publishing results to MMD and Chief Surveyor for approval and post approval enabling the results in the ePariksha system.
5. Providing assistance to MMDs to generate reports.

3. TERMS AND CONDITIONS :

- a) The work will be awarded to lowest of the eligible bidder
- b) Bidder is not permitted to alter or modify their bids after expiry of the deadline for receipt of the bids.
- c) All the taxes would be borne by the service provider.
- d) The contract shall be terminated at any time, in case, the services are not found satisfactory.
- e) The payment will be made on **quarterly** basis only on satisfactory performance of the work. No interest would be payable on account of delayed payment.
- f) The successful bidder will have to enter into an agreement with DGS on a non judicial stamp paper of Rs. 100/-.
- g) In case of breach of any terms and conditions attached to this contract, the Performance Security Deposit of the agency will be liable to be forfeited by the Department besides annulment of the contract.
- h) The Director General of shipping reserves the right to accept or reject the quotation in full or part without assigning any reason thereof. The decision of the Directorate in this regard shall be final and binding on the firm.
- i) The successful bidder will have to submit an interest free performance security deposit in the form of Bank Guarantee valid for a period of **12+2 months** from

the award of contract, of an amount equivalent to 10% of contracted work as an interest-free 'Security Deposit' with the DGS, which will be refundable after completion of contract period.

4. INSTRUCTION TO THE BIDDERS

a. **Two Bid System** : This is a Two Bid System Tender. The interested eligible entities who accept the above terms and conditions may submit their quotation in two separate envelopes, namely Technical Bid and Financial bid. These two envelopes should be superscribed as 'Technical Bid' and "Financial Bid". These two envelopes should be properly sealed and should be placed in a bigger envelop with the words "**Quotation for Annual Maintenance Contract for e-Pariksha computer based examination system for Marine Engineer Officer [MEO] -Class IV** ' The quotation shall be submitted along-with a demand draft of **Rs. 50,000/-** in favour of 'Directorate General of Shipping, Mumbai' as an earnest money deposit. The same will be returned to the bidders after successful completion of tender process.

A) **The Technical Bid** must contain the following:

1. Service provider should submit their profile in respect of providing similar services along with their contact details.
2. The certificate/s of satisfactory performance of similar work from its previous clients which must include at least two such work orders from the previous organizations, during last 3 years.
3. PAN No.
4. Service tax registration number
5. A names, address, contact number of the proprietor/partners/ shareholders of the bidding concern.
6. The bidder must have an annual turnover of Rs.900000 or more for the each of financial years 2013-14 & 2014-15. The audited profit and loss account must be submitted along with the copy of Returns of Income for the AY 2013-14 and AY 2014-15.

7. Demand Draft of Rs 50,000/- as EMD

B) The Financial bid :

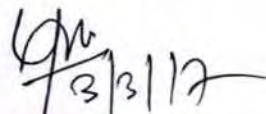
1. The Financial bid should be submitted in a separate, sealed envelope, failing which the bid would be treated as invalid. Financial bid be submitted as per annexure-1.

2. In case only one bidder is found technically eligible, no financial bid will be opened for lack of competition.

5. The quotations may be sent to "Assistant Director General of Shipping [Administration], Beta Building, I-Think Techno Campus, Kanjur Marg, Mumbai – 400 042." In a sealed cover super scribed "Quotations for "Quotation for Annual Maintenance Contract for e-Pariksha computer based examination system for Marine Engineer Officer [MEO] -Class IV" latest by 13.00 p.m. on 24th March, 2017. The Quotations received after the stipulated date/time shall not be entertained.

6. The technical bids will be opened first on 24th March, 2017 at 15.00 a.m. in the office of the Directorate General of Shipping, Kanjur Marg, Mumbai. The financial bid of only those firms will be opened which meets the minimum eligibility conditions in technical bids. The date & time for opening the financial bids will be intimated separately to the bidders who qualify the technical bids. The tender will be awarded to the firm which meets the eligibility criteria and quotes the lowest rate.

7. The interested firms who have submitted quotations may present themselves or through their authorized representative at the time of opening of quotations, if so desired. Over writing must be avoided and if done should be countersigned by the authorized person.



[Surendra Kumar]
Asstt. Director General of Shipping

Copy to:

The DDG[e-governance] , Directorate General of Shipping, with a request to upload the above said Tender enquiry on this Directorate's website for wider circulation.

ANNEXURE-I

FINANCIAL BID

[FOR ONE YEAR]

Sr.No.	Type of service	No. of hours	Fee per hour	Service fee
1.	Maintenance & ongoing Development services			
2.	MMD Support Desk [Technical Support Services]			
3.	Candidate Support Desk [Customer Support Services]			
4.	Question Bank Maintenance Services			
5.	Best practices Consulting and Project Management			
6.	Enhancement to Question Bank Maintenance service cost			
	TOTAL COST :			



Name & Signature of the bidder

Date

seal

BID FORM

To:
To
The Additional Director General of Shipping,
Directorate General of Shipping,
9th floor, Beta Building, i-Think Techno Campus,
Kanjurmarg East,
Mumbai – 400 042

NIT Ref. No:

Having examined the Bidding Documents including Addenda Nos., if any issued _____, the receipt of which is duly acknowledged, we, the undersigned, offer to supply and deliver..... (Description of Goods and Services) in conformity with said bidding documents.

We, undertake, if our bid is accepted, to deliver the goods in accordance with the delivery and Installation schedule specified in the aforesaid bid document.

If our bid is accepted, we will submit performance security in a sum of equivalent to 10% of the Contract Price for the due performance of the contract.

We agree to abide by this bid for a period of 180 (one hundred eighty) days after the date fixed for bid opening and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal contract is prepared and executed, this bid together with your written acceptance thereof shall constitute a binding contract between us.

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1988".

We confirm that stipulated Bid Security is enclosed herewith as a part of bid.

We understand that you are not bound to accept the lowest or any bid you may receive.

We accept all your terms and conditions stipulated in this bid document without deviations, both technical & techno-commercial.

Dated this.....Day of..... 2014.....

(Signature)

(In the capacity of)

Duly authorised to sign Bid for and on behalf of

Signed

1. PERFORMA OF BANK GUARANTEE TOWARDS EMD

(on non-judicial paper of appropriate value)

Bank Guarantee No. _____

Dated:

To

The Additional Director General of Shipping,
Directorate General of Shipping,
9th floor, Beta Building, i-Think Techno Campus,
Kanjurmarg East,
Mumbai - 400 042

Dear Sir(s),

Whereas the Directorate General of Shipping having its office at Mumbai (hereinafter called the DGS) which expression shall, unless repugnant to the context or the meaning thereof, include all its successors, administrators, executors and assignees has on behalf of the President of India invited tender No. _____ and M/s _____

_____ having Registered/head office at _____
(Hereinafter called the "bidder" which expression shall, unless repugnant to the context or the meaning thereof, mean and include all its successors, administrators, executors and assignees) have submitted a Proposal Reference No. _____ and bidder having agreed to furnish as a condition precedent for participation in tender an unconditional and irrevocable bank guarantee of Rs _____

_____ (Rupees _____ Only) for the due performance of bidder's obligations as contained in the tender document specially the conditions that (a) bidder shall keep his Proposal open for a period of day i.e. from _____ to _____ or any extension thereof, and shall not withdraw or modify it in a manner not acceptable to the DGS (b) the bidder will execute the contract, if awarded, and shall furnish performance guarantee in the format prescribed by the DGS within the required time. The bidder has absolutely and unconditionally accepted these conditions. The DGS and the bidder have agreed that Proposal submitted by the bidder is an offer made on the condition that the Proposal, if submitted would be kept open in its original form without variation or modification in a manner not acceptable to the DGS for a period of _____ days i.e. from _____ to _____ or any, extension thereof and that submission of the Proposal itself shall be regarded as an unconditional and absolute acceptance of the conditions, contained in the tender document. They have further agreed that the contract consisting of tender document and submission of the Proposal as the ACCEPTANCE shall be a separate contract distinct from the contract which will come into existence when the Proposal is finally accepted by the DGS. The consideration for this separate initial contract preceding the main contract is that the DGS is not agreeable to sell the tender documents to the bidder and to consider the Proposal to be made except on the condition that the Proposal shall be kept open for the period indicated above and the bidder desires to submit a Proposal on this condition after entering into this separate initial contract with the DGS promises to consider the Proposal on this condition and bidder agrees to keep this proposal open for the required period. These reciprocal promises form the CONSIDERATION for this separate initial contract between the parties.

2. Therefore, we _____ registered (indicate the name of Bank) under the laws of _____ having head/registered office at (hereinafter referred to as the "Bank") which expression shall, unless repugnant to the context or meaning thereof, include all its successors, administrators and executors hereby issue irrevocable and unconditional bank guarantee and undertake to pay immediately on first demand in writing Rupees all money to the extent of Rs _____ (Rupees _____ only) at any time immediately on such demand without any demur, reservations, recourse, contest or protest and/ or without any reference to the bidder and any such demand made by the DGS on the bank shall be conclusive and binding notwithstanding any difference between the DGS and the bidder or any dispute pending before any court/arbitrator or any other matter whatsoever. We also agree to give that Guarantee herein the DGS in writing. This guarantee shall not be determined/discharged/affected by the liquidation, winding up, dissolution or insolvency of the bidder and will remain valid, binding and operative against the bank.

3. The bank also undertakes that the DGS at the option shall be entitled to enforce this guarantee, against the Bank as a principal debtor, in the first instance, without proceeding against the bidder.

4. The bank further agree that as between the bank and the DGS, purpose of the guarantee, any notice of the breach of the terms and conditions contained in the tender Documents as referred above given to the bank by the DGS shall be conclusive and binding on Bank, without any proof, notwithstanding any other matter or difference or dispute whatsoever. We further agree that this guarantee shall not be affected by any change in our constitution, in the constitution of the DGS or that of the bidder. We also undertake not to revoke, in any case, this Guarantee during its currency.

5. The bank agree with the DGS that the DGS shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms of the tender or get extension of the validity period from time to time. We shall not be relieved from our liability by reason of any such variation or extension of the validity period or for any forbearance, act of omission and commission on the part of the DGS or any indulgence shown by the DGS to the said bidder or by any such matter or thing whatsoever which under the law relating to sureties, would, but for this provision, have the effect of so relieving us.

6. Notwithstanding anything contained here in above our liability under his Guarantee is limited to Rs. _____ (Rupees _____ only) in aggregate and it shall remain in full force upto _____ (225 days from the date of bid opening) unless extended further from time to time, for such period as may be instructed in writing by M/s _____ on whose behalf this guarantee has been given, in which case, it shall remain in full force upto the expiry of extended period. Any claim under this guarantee must be received by us before _____ (date of expiry of validity period) or before the expiry of extended period, if any. If no such claim is received by us within the said date/extended date, the rights of the DGS under this guarantee will cease. However, if such a claim has been received by us within and upto the said date/extended date, all right of the DGS under this guarantee shall be valid and shall not cease until we have satisfied that claim.

7. In case contract is awarded to the Bidder here in after referred to as "Contractor" the validity of this Bank Guarantee will stand automatically extended until the bidder furnished to the DGS a bank guarantee for requisite amount towards performance guarantee for satisfactory performance of the contract. In case of failure to furnish performance bank Guarantee in the format prescribed by the DGS by the required date the claim must be submitted to us within validity period or extended period, if any. If no such claim has been received by us within the said date /extended date, rights, of the DGS under this guarantee will cease. However if such a claim has been received by us within the said date/extended date all rights of the DGS under this guarantee shall be valid and shall not cease until we have satisfied that claim, In witness where of the Bank, through its authorized officer, has sent its hand & stamp on this _____ day of at _____ of _____ at _____ of _____ (month & year).

Signature

(Full name in capital letters)

Designation with bank stamp

Witness No.1

Signature

(Full name and address in capital letters)

Witness No.2

Signature

(Full name and address in capital letters)

Attorney as per power of attorney

No _____

Date _____

2. PERFORMA OF PERFORMANCE BANK GUARANTEE

(on non-judicial paper of appropriate value)

3.

Dated:

To

The Additional Director General of Shipping,
Directorate General of Shipping,
9th floor, Beta Building, i-Think Techno Campus,
Kanjurmarg East,
Mumbai - 400 042

BANKS GUARANTEE NO:

Dear Sir(s),

In consideration of the Directorate General of Shipping (hereinafter called "DGS") having offered to accept the terms and conditions of the proposed agreement betweenand..... (hereinafter called "the said contractor(s)" for the work(hereinafter called "the said agreement") having agreed to production of an irrevocable Bank Guarantee for Rs.....(Rupees.....only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We(hereinafter referred to as the "Bank") hereby undertake to (indicate the name of the Bank) pay to the DGS an amount not exceeding Rs..... (Rupees.....only) on demand by the DGS.

2. We(indicate the name of the Bank) do hereby undertake to pay the amounts due and payable under this Guarantee without any demur, merely on a demand from the DGS stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs.....(Rupees.....only).

3. We, the said Bank, further undertake to pay to the DGS any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder, and the contractor(s) shall have no claim against us for making such payment.

4. We (indicate the name of the Bank) further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement, and it shall continue to be enforceable till all the dues of the DGS under or by virtue of the said agreement have been fully paid, and its claims satisfied or discharged, or till the representative of DGS, on behalf of the Government, certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor(s), and accordingly discharges this guarantee.

5. We(indicate the name of the Bank) further agree with the DGS that it shall have the fullest liberty without our consent, and without effecting in any manner our obligations hereunder, to vary any of the terms and conditions of the said agreement or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by DGS against the said contractor(s), and to forbear or enforce any of the terms and conditions relating to the said agreement, and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act of omission on the part of the DGS or any indulgence by the DGS to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This Guarantee will not be discharged due to the change in the constitution of the Bank or the contractor(s).

7. Welastly undertake not to revoke this Guarantee except with (indicate the name of the Bank) the previous consent of the DGS in writing.

8. This Guarantee shall be valid up tounless extended on demand by the DGS. Notwithstanding anything mentioned above, our liability against this Guarantee is restricted to Rs (Rupeesonly), and unless a claim in writing is lodged with us within six months of the date of expiry or extended date of expiry of this Guarantee all our liabilities under this Guarantee shall stand discharged.

Dated theday of..... For
Granted by the Bank

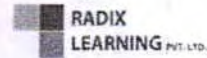
Yours faithfully....

Clause for Experience:

- 4.1 Experience:**(a) Those bidders who are regular manufacturers of the tendered item should provide documentary evidence in support of their experience in the form of past purchase orders and their successful completion certificates for the tendered item. The purchase orders and successful completion certificates should be on the name of the bidders in any of the past 5 years (2011-2016) clearly mentioning that the bidder has satisfactorily executed supply, installation and commissioning of the tendered equipment. The bidders shall furnish "End User Certificates" indicating contact details i.e. name of person, phone/fax/mobile nos. etc where the equipment is installed. End User Certificates/Client Certificates submitted by the bidder along with the bid shall be subject to verification. (b) Those bidders who are authorized agents of the regular manufacturers of the tendered item should provide documentary evidence in support of experience in the form of past purchase orders and their successful completion certificates for the tendered item. The purchase orders and successful completion certificates should be either on the name of the bidding agent or in the name of the Principal/ manufacturer in any of the past 5 years (2010-2015) clearly mentioning that the bidder or its Principal has satisfactorily executed supply, installation and commissioning of the tendered equipment. The bidding agent shall furnish an undertaking/ authorization from the Principal/ Manufacturer for participating in this tender clearly mentioning that all necessary support for installation and commissioning of the tendered equipment shall be provided by the Principal to the bidding agent. The bidders shall furnish "End User Certificates" indicating contact details i.e. name of person, phone/fax/mobile nos. etc where the equipment is installed. End User Certificates/Client Certificates submitted by the bidder along with the bid shall be subject to verification.



ANNEXURE = IV



Software Requirements Specification

Design, Development and Deployment
of a
Computer Based Assessment System
for
DG Shipping
towards
Assessment of Competencies
of
MEO Class IV

Version 1.1

August 6, 2010

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1. Introduction

The Directorate General of Shipping (to be referred to as DGS hereinafter), India deals with implementation of shipping policy and legislation so as to ensure the safety of life and ships at sea, prevention of marine pollution, promotion of maritime education and training in co-ordination with the International Maritime Organization, regulation of employment and welfare of seamen, development of coastal shipping, augmentation of shipping tonnage, examination and certification of Merchant Navy Officers, Supervision and Control of the allied offices under its administrative jurisdiction.

The DGS is the apex organization that conducts examinations of competency and certification for the engineering and the nautical branches. These examinations are conducted in India in seven different places, namely, Mumbai, Chennai, Kolkata, Kochi, Goa, Vishakhapatnam and NOIDA. These examinations are essentially written examinations in proctored environment, followed by oral examinations. These examinations are conducted regularly through the year, and the schedule of conduct is announced well in advance.

It is the articulated intention of DGS that these examinations of competencies for both the engineering and nautical branches be conducted on a strongly architected, robustly designed, and effectively implemented computer based assessment system, while continuing the conduct of the oral examinations in synch as at present.

The project is entitled "Design, Development, and Deployment of a Computer Based Assessment System of the Competencies of MEO Class IV". In short, the project involves design, development & deployment of the DGS Competency Assessment System.

This Software Requirements Specification (SRS) document provides the entire set of requirements in terms of functions and performance of the DGS Competency Assessment System.

1.1 Purpose

The primary purposes of the SRS are:

- To capture and document the requirements of the various subsystems of the computer based assessment system of the competencies of MEO Class IV for DG Shipping
- To serve as the focal input for performing the software architecture and detailed design functions for the computer based assessment system
- To serve as the common medium of communication amongst the various stakeholders of the project

- To serve as the principal source documentation for all other phases of the software engineering exercise such as Software Architecture, Software Design, Software Development, Software Testing, Software Deployment, and Software Maintenance

The SRS is expected to serve a wide audience of stakeholders in this project. The key stakeholders who form part of the intended audience of the SRS are:

- Director General, Shipping (DGS)
- Chief Examiner, DG Shipping (CE-DGS)
- Special Officer of DGS (Mr. Ratna Sekhar from MMD, Chennai)
- DGS Officers, Chief Surveyor cum Additional DG(Technical), Dy Chief Surveyor cum Sr Dy DG(Technical) and Engineer and Ship Surveyor cum Dy DG(Technical)
- System Administrator at DGS (Currently Consultant from CDAC attached to DGS)
- Principal Officers of Mercantile Marine Departments (PO-MMDs), Surveyor-in-charge(MMD)
- Dy. Chief Surveyors cum Sr Dy DG (Technical) and Engineer and Ship Surveyor cum Dy DG (Technical) supporting the PO-MMDs
- Software Engineering Team at IITB, including Software Architect, Software Designers, Programming Team, Testing & QA Team, and Maintenance Team

1.2 Scope

The project is entitled "Design, Development, and Deployment of a Computer Based Assessment System of the Competencies of the Engineering & Nautical Branches of DG, Shipping". In short, the project involves design, development & deployment of the DGS Competency Assessment System. The following are the salient features of the project.

- The project involves the design and development of the following subsystems
 - CREBS: Candidate Registration & Examination Booking Subsystem
 - CERS: Candidate Examination Rendering Subsystem
 - BQAS: Basic Question Authoring Subsystem
 - SQAS: Special Question Authoring Subsystem
 - ECS: Examination Configuration Subsystem

- ARAS: Administration, Reporting & Audit Trail Subsystem
- The needs of competency assessment of the engineering and nautical branches are significantly different, and these different needs will have to be accommodated well in the assessment system
- The assessment system must provide a variety of questions that address the specific competencies being addressed, thereby going beyond the traditional multiple-choice question types
- It is recognized that the repertoire of question types designed and developed for specific competencies would have to evolve and grow over time, and therefore the assessment system must be architected in such a manner as to be flexible enough to accommodate myriad of question types
- The database or the repository of questions (questions, in common parlance) must be initially created with sufficient numbers to enable the longevity of the assessment system and deliver a good Return on Investment (ROI) to DGS
- The assessment system should be capable of creating an examination paper for each candidate that is distinct, and yet, be equivalent to other examination papers created and used for different candidates
- The assessment system should be capable of evaluating these examinations immediately and make available the result (and possible feedback to candidates)
- The assessment system would provide a strong suite of tools to enable authoring of questions by authorized domain experts
- The assessment system would provide a simple user interface to the authorized officer of DGS who can create and specify the "rules" for the assembling of an examination paper on-the-fly from the questions database
- The assessment system would be deployed in a secure, LAN environment, in a proctored Intranet setup for the conduct of examinations at different centers with locally secured databases
- The assessment system would maintain a master database, controlled only by DGS and none else
- The assessment system would provide a method of synchronizing the required database subsystems at the examination centers with the master database at DGS in a secure and encrypted manner

- The assessment system would have a subsystem that enables the candidates to make an application for appearing in a specific center on a specific date through a web-based application
- The assessment system would provide for the transfer of required data to be used in existing eGovernance modules of DGS through a commonly agreed upon standardized format
- The assessment system would provide a rich set of tools for effective administration of examinations and allied activities at DGS and at the examination centers
- The assessment system would provide for a set of tools for report generation
- The assessment system would also provide for fail-safe procedures in protecting the assessment assets and data through well-defined backup and other techniques
- The assessment system would also provide a facility for a reasonable “roll back” in the examination in the unlikely events of a computer hardware failure at the examination center or a browser freeze

1.3 Features of the Proposed DGS Competency Assessment System

The DGS Competency Assessment System comprises of two main subsystems – the parts that deal with candidate application for examination, center, and date, and the parts that enable creation and delivery of computer based assessments. The features of the proposed DGS Competency Assessment System, from a high level of abstraction are provided below in Figure 1.1 to offer a top level understanding. Figure 1.2 represents another view of the DGS Competency Assessment System in a hierarchical view of two main streams, one dealing with the candidate’s application for examination and the other dealing with the preparation and conduct of the examination itself.



Figure 1.1: Features of the Proposed DGS Competency Assessment System

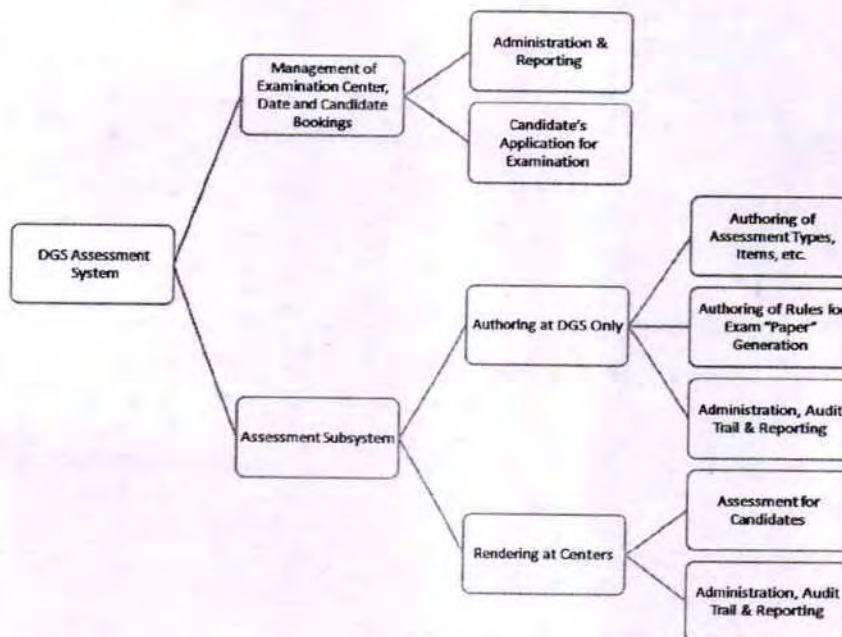


Figure 1.2: Hierarchical View of Two Main Streams of the DGS Competency Assessment System

The proposed structure envisages the creation of a central examination operation control node at DGS in Mumbai. It is only in this central examination operation control node that the following activities are to take place.

- Development of question types (decision on what type of questions would be appropriate to assess certain competencies) and expected answers
- Management of the database of question types and questions in terms of creation, view, review, approval, modification, and deletion
- Development and specification of assessment rules for the generation of a candidate's examination question paper dynamically for each of the papers
- Management of the database synchronization operations, etc. vis-à-vis the databases at each specific examination center
- Final approval of candidates' examination results, issue of certificates, etc.
- Management of the calendar of examinations across each of the centers

The examination centers, on the other hand, would have hardware, software and networking platforms similar to that in the DGS Center, but with the limited functionality of managing the examination process at each of these centers. The examination centers would be able to perform the following activities:

- Approval / rejection of a potential candidate's examination application by designated authority from each of the examination centers. However, DGS (being the appellate authority) will be able to recall any decision taken by any MMD and intervene suitably as need be.
- View and modify the calendar of examinations at the center (based on inputs from DGS) and based on local conditions such as holidays, specific environmental conditions, demand, etc.
- Management the facilities of the center in terms of seats available, bookings, etc.
- Communicate with the candidate from the time of application, to scrutiny and approval
- Scrutinize the candidate's application and other documents when he/she reports for examination
- Initiate an examination on behalf of candidate, proctor it, perform specific actions in case of unforeseen circumstances, and administer the process for a candidate

- View, display and report on performance of candidates on a variety of conditions
- Manage the communication of examination results, audit trail, etc. to the DGS
- The examination results of MEO Class IV are to be made available for migration/integration within the existing software modules of DGS.

The examination centers typically would not have any authority to modify, delete or change any of the database items that deal with question types, questions, the candidate's answers in examinations, evaluation reports, and audit trails. Access is provided to examination centers on the basis of just enough capabilities, facilities, features and authority required to administer the examinations effectively & efficiently – no more, and no less. This is done primarily to ensure the credibility of the DGS Assessment System, manage the security, integrity and reliability of the processes.

This structuring of responsibilities and its interplay with the various centers is depicted in Figure 1.3 below.

The top-level structuring indicated would form the basis of the technological architecture of the DGS Competency Assessment System, the typical hardware-software-networking environment required, and the design of individual subsystems.

The architecture itself would be created in such a manner that it is resilient to changes in the organizational structure of DGS in terms of addition of number of examination centers, and similar manifestations.

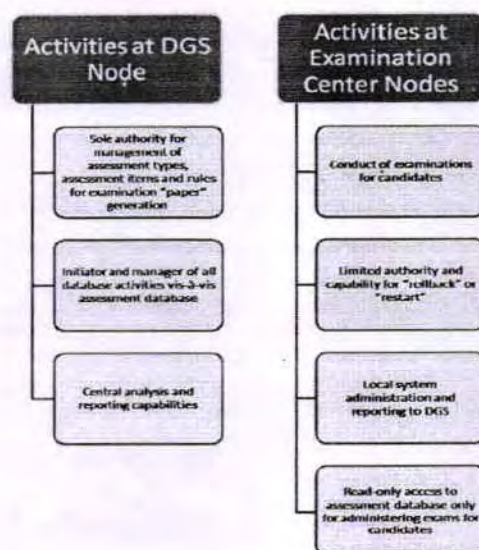


Figure 1.3: Activities Typically Performed at DGS Node & Examination Center Nodes

1.4 References

The following are the complete list of documents referenced in this SRS.

1. Project Proposal for the "Design, Development, and Deployment of a Computer Based Assessment System of the Competencies of the Engineering & Nautical Branches of DG, Shipping", Proposal Submitted by IITB to DG Shipping, 11 January 2010.
2. Professional Services Agreement signed between IITB and DG Shipping on 8th July 2010.
3. Statement of Work signed between IITB and DG Shipping on 8th July 2010.
4. Training and Assessment Programme, Maritime Education, Training and Assessment (META) Manual, Volume I, STCW Implementation Cell, DG Shipping, Shroff Publishers and Distributors Private Limited, Mumbai, November 2008.
5. Training and Assessment Programme, Maritime Education, Training and Assessment (META) Manual, Volume II, STCW Implementation Cell, DG Shipping, Shroff Publishers and Distributors Private Limited, Mumbai, November 2008.

1.5 Overview

The rest of the SRS contains a perspective of the Computer Based Assessment System for the competencies of MEO Class IV of DG Shipping – the product being engineered through this project. The SRS provides the overall description of the product being developed in terms of the system interfaces, interfaces between the software and the users, hardware interfaces, software interfaces, communication interfaces, memory constraints, operations also known as user interfaces, and site adaptation requirements. The SRS additionally contains description of product functions, user characteristics, constraints, assumptions & dependencies, and apportioning of requirements. This part of the SRS would be of interest to stakeholders who are customers and end-users such as DGS, Chief Examiner, Officers of the DGS who work on the various examinations, System Administrators of DGS, Program Managers of DGS for this specific project, Authors of Assessments, and Candidates who take examinations.

The rest of the SRS also contains detailed description of specific requirements of the product - the Computer Based Assessment System for the competencies of MEO Class IV of DG Shipping. This section of the SRS would be documented through a process of analysis using the Unified Modelling Language (UML). This part of the SRS would be of interest to the Program Manager of DGS, technical personnel of DGS, Software Architect(s) of IITB, Software Designers of IITB, and the software development teams.

The rest of the SRS is organized into 5 more sections. The organization of the rest of the SRS is as follows.



Section 2 – The Overall Description of the Software Product & Its Requirements

If you are the Director General of Shipping, or the Chief Examiner, or one of the Officers of DGS who works with the Chief Examiner (Dy. Surveyors, etc.), Domain Experts who work on creating questions for the various examinations, or End Users (such as administrative personnel) who are more interested in how to use the product rather than on the technical details of the product, this section is a must-read.

Section 3 – Specific Requirements

If you are a stakeholder from DGS or the MMDs interested in a more formal specification of the requirements of the system (product) or a software architect, designer or a software engineer who is part of the development team, this section is a must-read. For the Special Officer of DGS in charge of this project, the Chief Engineer, the Principal Officers of MMDs or their delegates, and the Consultant to DGS from CDAC must read this section very carefully.

Section 4 – Change Management Process

This section describes the change management process that would be used throughout the duration of this project. This describes the process used to identify, log, evaluate, and update the SRS to reflect changes in project scope and requirements. This also describes the process used to control the change in requirements, communication protocols, etc. This section is a must-read for the Special Officer of DGS in charge of this project, the Consultant to DGS from CDAC, and the Chief Examiner.

Section 5 – Document Approvals

This section describes the process by which the document approvals would be obtained from the customer – the DG Shipping. Reading this section is essential for the DG Shipping, the Chief Examiner, the Special Officer of DGS in charge of the project, and the Consultant of DGS from CDAC.

Section 6 – Supporting Information to the SRS

This section describes the various supporting information that are either part of the SRS or are part of additional, supporting information to the SRS. Every reader of the SRS must read this section.



2. The Overall Description

This section describes the general factors that affect the product and its requirements. This section does not state specific requirements. Instead, it provides a background for those requirements, which are defined in section 3, and makes them easier to understand. In a sense, this section tells the requirements in plain English for the consumption of the customer. Section 3 will contain a specification written for the developers. The following are the general factors that affect the product and requirements.

1. Entirely Computer Based Assessment & Evaluation

The system (product) must be computer based for the assessment of the competencies of MEO Class IV and for swift evaluation of the performance and results of candidates in the examination.

- a. The system shall enable the complete conduct of a candidate's assessment on a computer for the various papers of MEO Class IV Part B only.
- b. The system shall provide the capability of using Basic Question types such as multiple-choice-single-answer questions, multiple-choice-multiple-answer questions, fill in the blank, numerical answers to problems, etc.
- c. The system shall provide the capability of using Special Questions that are generated rather than stored as-is, so that a large number of variants of questions of structural similarity are obtained
- d. The system shall provide the capability of using task-centric assessments which are more amenable to assessing the competencies of candidates than the Basic Question type in (b) above
- e. The system shall evaluate the candidate's answers immediately on submission

2. Large Databank of Questions

- a. The system shall provide facilities to author, store and use a large databank of questions thereby reducing the probability of candidates using unfair means
- b. The system shall provide facilities to author special question types that enable generating large numbers of questions thereby reducing the probability of candidates using unfair means

- c. A large data bank of questions reduces the strain on the Office of the Chief Examiner in locating domain experts on a continuous basis for setting and evaluating examinations

3. Not Restricted to Multiple Choice Question types

- a. The system shall provide the facility to author Task-centric questions thereby increasing the credibility of the assessment of competencies, while reducing the probability of candidates using unfair means
- b. The system shall provide the flexibility to be able to accommodate a wide repertoire of task-centric assessments over time with varying degrees of complexity and sophistication

4. Achieving Efficiency for Candidates

- a. The system shall provide for web based registration and booking for examination date-time slots at specific examination centers from anywhere in the world in just a few minutes
- b. The system shall provide the candidates with the ability to track their applications, bookings and examination results efficiently without consuming bandwidth of the officers of MMDs or the DGS
- c. The system shall make available the results of the computer based examinations immediately after the examination thereby reducing the normal delays required by manual evaluation of the answer scripts

5. Achieving Efficiency for Domain Experts / Examiners

- a. The system shall provide for authoring tools for effective and efficient creation and uploading of questions
- b. The system shall provide for efficiency to domain experts and examiners by reducing the regular need to provide questions within tight deadline
- c. The system shall eliminate the burden of time consuming evaluation of candidates answer scripts at regular intervals

6. Architecture and Design to Offer Flexibility for Accommodating Examinations of Nautical Branch

- a. The system shall be architected and designed to offer flexibility to accommodate examinations of the nautical branch in future



7. Developing a Solution with a Product Orientation

- a. The system shall be architected and designed in a manner of product development
- b. The system shall be capable of being packaged and made available as a solution by the DGS to other sea faring nations of the world

8. Achieving Effectiveness & Efficiency for Examination Authorities of DG Shipping

- a. The system shall provide for an effective and efficient mechanism for managing the examination process of MEO Class IV from application to examination to evaluation to declaration of the results
- b. The system shall offer the facility to generate unique question papers dynamically for each candidate thereby nearly eliminating the loopholes that enable use of unfair means
- c. The system shall offer an auditable set of assessments and processes that helps reduce the incidence of frivolous complaints from candidates and applications for re-evaluation of answer scripts
- d. The system shall offer a comprehensive set of report generation and query facilities for all stakeholders, notably, the officers of DGS that helps reduce the large amounts of time they spend on answering Right to Information (RTI) queries or questions from the Parliament
- e. The system shall offer a comprehensive set of tools for managing audit trails to make the entire process highly accountable at all levels

2.1 Product Perspective

The market place is crowded with a wide range of computer based assessment products. A vast majority of such products cater to segments where the number of questions dealt with or the variety of question types dealt with are fairly limited. The products on computer based assessments available in the market can be broadly classified into two categories.

1. Generic computer based assessment products

This category is defined by market leaders such as QuestionMark (www.questionmark.com), Pearson VUE's Test Solutions (www.vue.com), and Prometric (www.prometric.com).

2. Domain Specific computer based assessment products

This category includes companies that offer computer based assessment products and solutions specific to the needs of being in compliance with STCW 95. Videotel's TOTS Computer Based Assessment (www.videotel.co.uk), INTERTANKO (www.intertanko.com)

The DGS has evaluated both categories of options and have articulated the vision of designing and developing a fully customized computer based assessment system for the various examinations in the engineering and nautical branches. In this project, however, it is the articulated vision to design and develop a fully customized computer based assessment system with special focus on MEO Class IV. The main ideas behind this choice are (a) to have a product customized to the Indian shipping industry and practices of DGS, (b) to enable easy maintenance, and expansion, (c) to have ownership over the product to be able to offer solutions to other sea faring countries around the world making this project financially attractive.

The project envisages the development of the Computer Based Assessment System to have 6 main subsystems. The various subsystems are depicted in Figure 2.1 below.



Figure 2.1: Top-Level View of Various Subsystems

2.2 System Interfaces

This subsection of the SRS lists each system interface and identifies the functionality of the software to accomplish the system requirement and the interface description to match the system. These are external systems that the users have to interact with.

2.2.1 Interfaces Between Product & its Users

The various users of the different subsystems are shown in Figure 2.2 below.

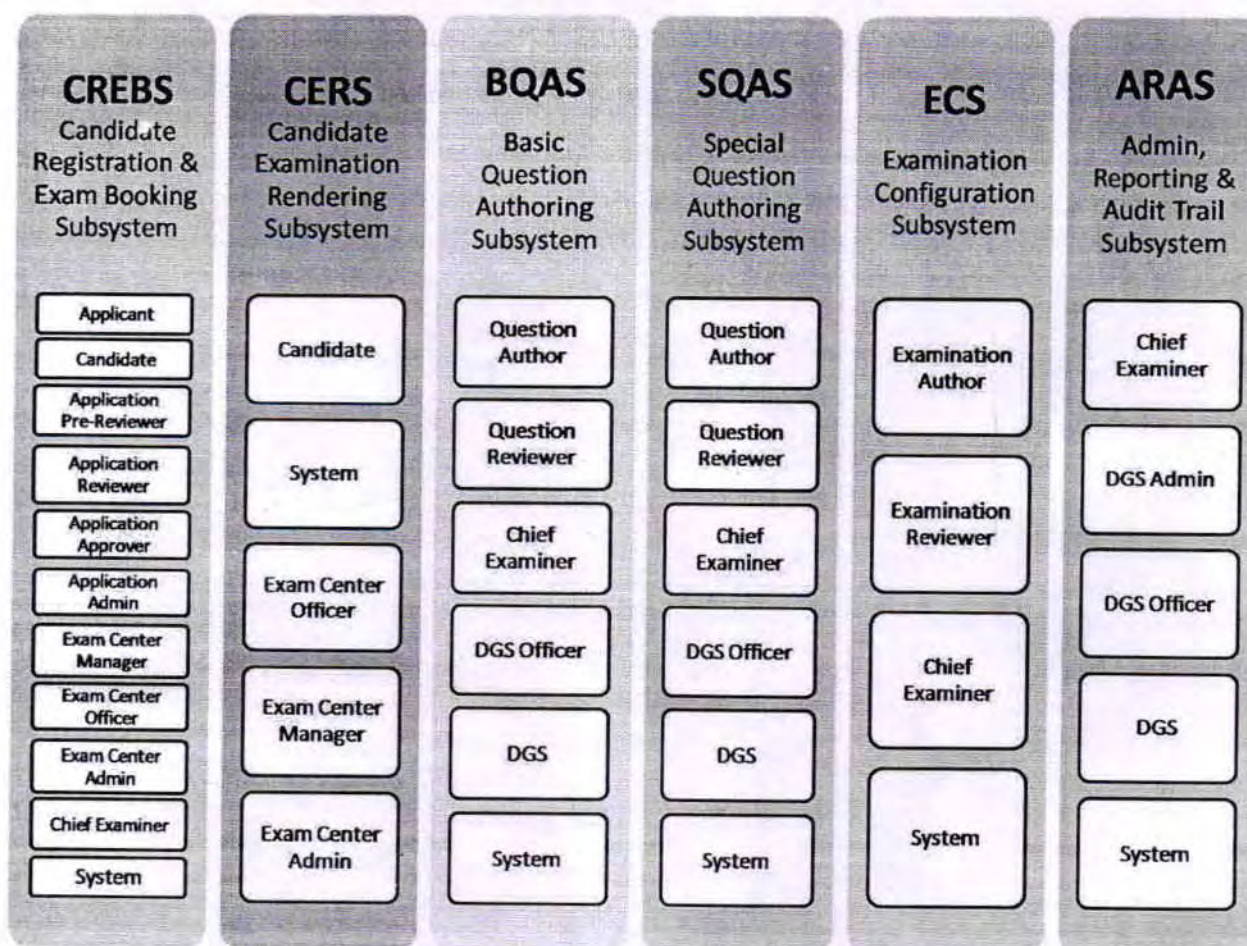


Figure 2.2: Different Subsystems and Primary Users of Each Subsystem

The users of the various subsystems of the product would be provided with a Graphical User Interface (GUI) to be able to interact and use the software subsystems. The interfaces would present a variety of interactive styles such as form-fill-in, menu option selection and wizard-like interfaces.

- CREBS – GUI based forms interface
- CERS – GUI with wide variety of interaction styles
- BQAS – GUI based form-fill-in interface
- SQAS – GUI with wide variety of interaction styles
- ECS – GUI wizard like interface
- ARAS – GUI menu based interface and query-by-forms

2.2.2 Hardware Interfaces

The system has no hardware interface requirements.

2.2.3 Software Interfaces

The system must work with Oracle 10g as the back-end database system at the DGS node.

The system must update certain database tables of existing applications of DGS whenever (a) applicant or candidate related data changes (from CREBS), and (b) candidate's performance in examinations (from CERS).

2.2.4 Communications Interfaces

The software uses standard communication interfaces and does not have any special, custom protocol communication interface requirements.

2.2.5 Memory Constraints

The system does not have any specific memory constraints requirements.

2.2.6 Operations

In this subsection, the business processes that impact the design are documented.

- There are various organizations involved in the operations of the DGS Computer Based Assessment System. They are the DGS itself, the various MMDs located at Mumbai, Kochi, Kolkata, Chennai, and NOIDA, and the different examination centers.
- The DGS serves as the central node in the operations. It is here that the major subsystems for the operations are controlled. Except for CERS, the Candidate Examination Rendering Subsystem, all the 5 other major subsystems are controlled directly by and within the DGS.
- CREBS, the Candidate Registration & Exam Scheduling Subsystem is the only publicly available and accessible subsystem. All the other 5 major subsystems are primarily used by relevant authors within a closely monitored, secure network.
- The examination centers at present are within the MMDs. In the operations of the computer based assessment system, the examination centers may be located within the MMDs or located outside it operated within a Public-Private-partnership (PPP) model going beyond the MMD locations to other cities as decided by the DGS. Additional control needs to be provided for such partnerships.
- The DGS is the central fulcrum of the entire operations. It is here that the main databases are located. Only a relevant portion of the databases are replicated in the examination centers. Specifically, the databases connected with the CERS subsystem and subsets of the databases connected with CREBS subsystem would be replicated within the examination centers.
- The databases would be pushed from the DGS to the various examination centers using secure Virtual Private Network (VPN) connections.
- The updated examination and candidate performance data at the various examination centers, especially after candidates complete the examination, would be communicated to the DGS database using secure Virtual Private Network (VPN) connections.
- Other than the candidates' examination paper which is generated dynamically, the candidates' answers, and the schedule of examinations at specific examination centers, all other databases replicated at the examination centers shall be on a read-only basis.
- All system administration functions, including database backup and recovery operations shall be performed on a regular, pre-determined basis by the local system administrators at the examination centers and at the DGS. The system shall provide alerts and a suite of tools to perform these operations.

- The system shall initiate certain crucial database administration functions automatically. In specific circumstances when database backup and recovery is performed, the various subsystems would not be operational. Such operations shall generally be scheduled in advance and be coordinated with the various examination centers.
- There are several independent applications that are currently operational at the DGS and at specific MMDs as part of the eGovernance project. The system shall directly update specific databases of these eGovernance applications.

2.2.7 Site Adaptation Requirements

The various site adaptation requirements at the DGS, the MMDs and the Examination Centers are described here.

At the DGS

- The DGS is the central node in the entire operations of the computer based assessment system. This implies that the DGS would host the central servers, and the personnel who would centrally administer the operations.
- The servers and other related hardware shall be placed in a room that is secure, with only authorized personnel capable of accessing it.
- The servers should have redundant power backups in terms of online UPS that would provide at least 4 hours of power to the servers, the network devices, and the peripherals so that the all major subsystems are operational even during power outages.
- Apart from the core system administrators, the other users of the DGS would have access points on their desks through PCs with Internet connection.

At the MMDs

- At the MMDs, there are no specific sever requirements.
- Only the users of MMD shall access the various relevant subsystems of DGS through secure, Internet connection.
- The Internet connection made available at each MMD shall be a non-shared connection that provides at least 512 Kbps bandwidth.

At the Examination Centers

- Each examination center shall have a physically secure location for housing the servers, the networking components, backup devices, etc. Access must be controlled to only authorized personnel.
- Each examination center shall have a reception area which is physically separated in a secure manner from the main examination center where the candidates appear in exams. The reception area shall have seating facility for at least as many candidates scheduled to appear in a particular examination slot.
- Each examination center shall have a cabin for the Examination Center Officer to be seated that provides complete view of the examination hall.
- Each examination center shall have at least 3 PCs apart from the PCs at the examination desks as redundant ones to be used in emergency.
- Each examination center shall have a dedicated Internet connection with a bandwidth of at least 1 Mbps connecting that center to the DGS with the potential for having VPN connections.
- Each examination center shall have a video surveillance of the examination hall.
- Each exam center, shall have a web cam installed on every PC in the examination hall.
- Each examination center shall have power backup facility in terms of online UPS to provide at least 3 hours of power to the servers and the examination workstations. There shall also be a genset back up to provide for power during longer power outages.

2.3 Product Functions

The computer based assessment system of the DGS has the following subsystems.

1. CREBS – Candidate Registration & Exam Booking Subsystem
2. CERS – Candidate Examination Rendering Subsystem
3. BQAS – Basic Question Authoring Subsystem
4. SQAS - Special Question Authoring Subsystem

5. ECS – Examination Configuration Subsystem
6. ARAS – Administration, Reporting& Audit Trail Subsystem

The summary of the major functions that each of these subsystems will perform are listed here.

2.3.1 CREBS – Candidate Registration & Exam Booking Subsystem

This subsystem called CREBS is the Candidate Registration & Exam Scheduling Subsystem. This is a web application that can be run from a browser. The main user of this subsystem is the Applicant / Candidate. Using CREBS, candidates can make an application for appearing in an exam, opt for specific center, and book their dates for the specific papers relevant for the exam.

An individual, called applicant, seeking to appear in the MEO Class IV examination would have to first *register* on the DGS portal. This is the application registration process and is done through an online registration form. The data supplied by the applicant is scrutinized by the authorized personnel at the MMD. The applications received would undergo a workflow process which involves scrutinizing the form, reviewing the form, approving the registration, seeking clarifications and other additional information from the applicant, keeping the application pending, or rejecting the application.

If the applicant's registration application is approved, an email would be sent to him/her informing that the registration is complete. It is only after the registration is complete that an applicant becomes a candidate who can seek to apply for taking exams in one or more papers of the MEO Class IV.

An application that falls seriously short of the requirements laid down for MEO Class IV examinations may be rejected. An applicant is free to apply again for registration after taking care of the issues mentioned as shortcomings.

The candidate can now seek to make a booking for examination in one or more papers at a specific examination center. The CREBS subsystem provides the facility for a candidate to select an examination center, browse the time slots available, and make booking for examinations. After the booking is done, the system sends an email confirming to the candidate that a booking has been done. The candidate can also view and/or print the Provisional Admit Card.

The CREBS subsystem also performs a set of housekeeping tasks that enable users from the DGS and MMD to query the database, generate reports and perform database administration. The administrator module for the officers at the examination center would provide the facilities of viewing the calendar of bookings; generate a range of reports for center's use as

well as for reporting to DGS. The administrator module would also enable the center to have limited access to modify data on test dates, facilities, etc.

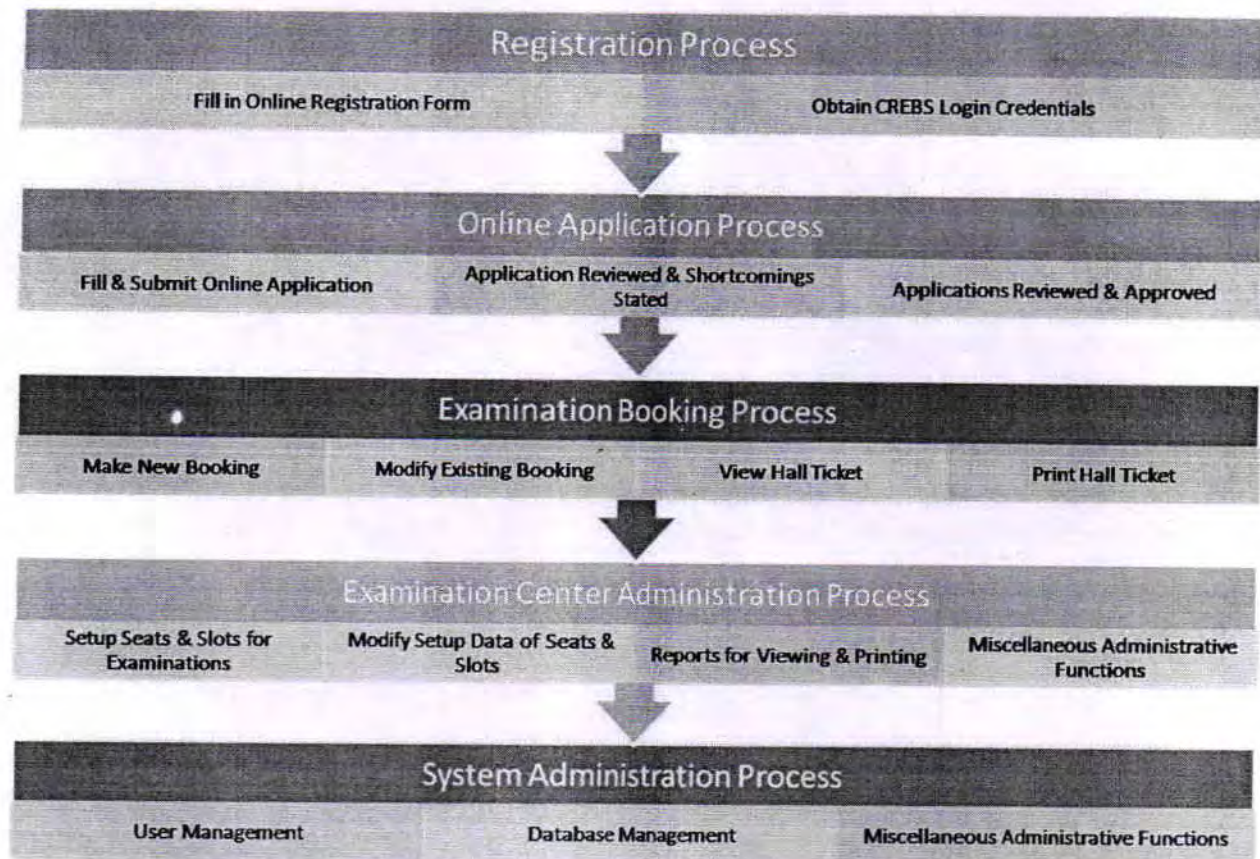


Figure 2.3: Overview of CRESS Subsystem

2.3.2 CERS – Candidate Examination Rendering Subsystem

CERS or the Candidate Examination Rendering Subsystem is the core subsystem used by the candidate. This subsystem is the one that administers the computer based assessment on a particular examination paper to the candidate.

The main user of this subsystem is the candidate. The other users who use the system for administrative purposes are the exam center officer, exam center administration and exam center manager.

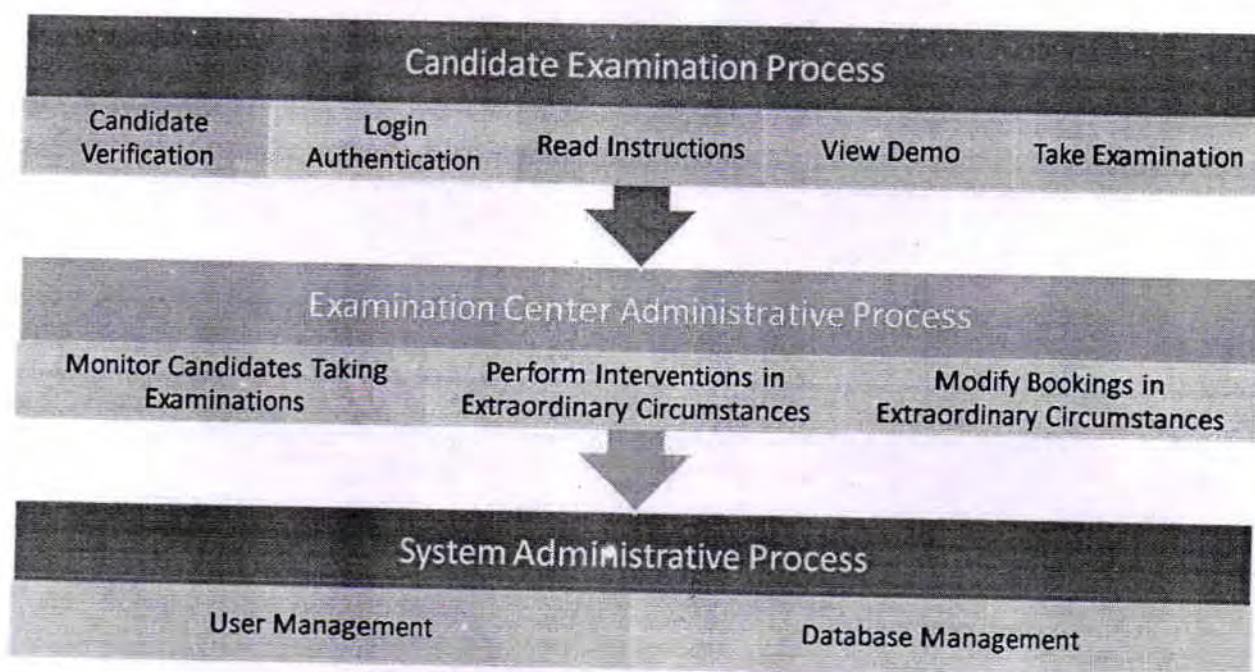


Figure 2.4: Overview of CERS Subsystem

Once a candidate has booked for an examination slot for a paper in an examination center and has printed the Provisional Admit Card, must present himself/herself at the examination center on the day of the examination at least 1 hour before the scheduled start of the examination. The candidate is expected to take along a number of original documents for verification by the exam center officer before being allowed to appear in the examination.

The CERS system provides facility for the exam center officer to verify the standard documents and update the system. Only when all the required verifications are complete, can the candidate appear in the examination. After verification, the CERS system allocates a special login id and password for the examination session only. This is to provide additional security.

The exam center officer, after verification, escorts the candidate to a particular workstation inside the examination hall. The candidate uses the session logon credentials provided to login to the CERS subsystem.

Candidates first read the instructions provided. Then they can take a demo on the computer based assessment system. Once they are ready to take the examination, they indicate this by choosing to start the examination.

The examination rendering module of this subsystem is actually conceived to be a rich Internet application that runs on a browser. The browser itself is a secure browser that allows one to work on the examination and nothing else (no right clicks, no opening of new tabs, etc.). This is to ensure security of the examination and enhance the integrity of the examination.



The CERS subsystem uses the active examination pattern configured using the ECS subsystem to generate dynamically an examination paper unique to a candidate. The examination papers would essentially be different for different candidates, and yet be "equivalent" in terms of coverage and level of difficulty. This is done primarily to discourage use of unfair means in the examinations.

The candidate answers the questions in the examination. The candidate can browse the questions, choose any question to answer, in any order, skip answering a question, review an answer, modify an answer and finally submit the answers. The results would be displayed upon completion of the exam and the candidate will have the ability to take a print out of the results if required.

The rich Internet application enables rendering of different types of questions, ranging from the core ones such as multiple choice questions, fill in the blank, matching lists, selecting from a list, arranging a list, etc. to competency-driven special assessments that require hotspot clicking, providing numerical answers to problems, carrying out specific tasks on the application's answering window. Examples of such types of variety of question types are given in the part that describes the Subsystem dealing with question type and question creation and management.

The CERS subsystem begins a clock timer when the candidate signals his/her choice to begin the examination. The candidate can choose to end the examination on time or before time. The system would provide alerts to the candidate at regular intervals (that is configurable) about time remaining before the end of examination. The system would forcefully stop an examination when time runs out.

The CERS subsystem freezes the candidate's examination, updates the database with the candidate's answers, performs evaluation, and updates the results on the database. The CERS subsystem updates the candidate's performance and results into the DGS database.

With this, the candidate's interaction with the CERS subsystem is over.

The description documents what happens in a smooth situation when no extraordinary circumstances occur. In reality, though, several unusual circumstances can occur preventing the candidate from taking the examination in a free, uninterrupted manner. It is possible that interruptions can occur by a wide variety of circumstances such as server errors, network outages, power failures, candidate's PC becoming unresponsive, etc. To deal with these situations, the CERS subsystem provides the exam center officer with a variety of tools. For instance, the exam center officer may migrate a candidate from one PC to another when the original one becomes unresponsive. The exam center officer shall have the capability to restart a suspended examination, and roll back to a previously saved spot, and even allocate time remaining on resumption of the examination.

The CERS subsystem also provides a set of facilities to perform a range of administrative tasks, querying and report generation.

2.3.3 BQAS – Basic Question Authoring Subsystem

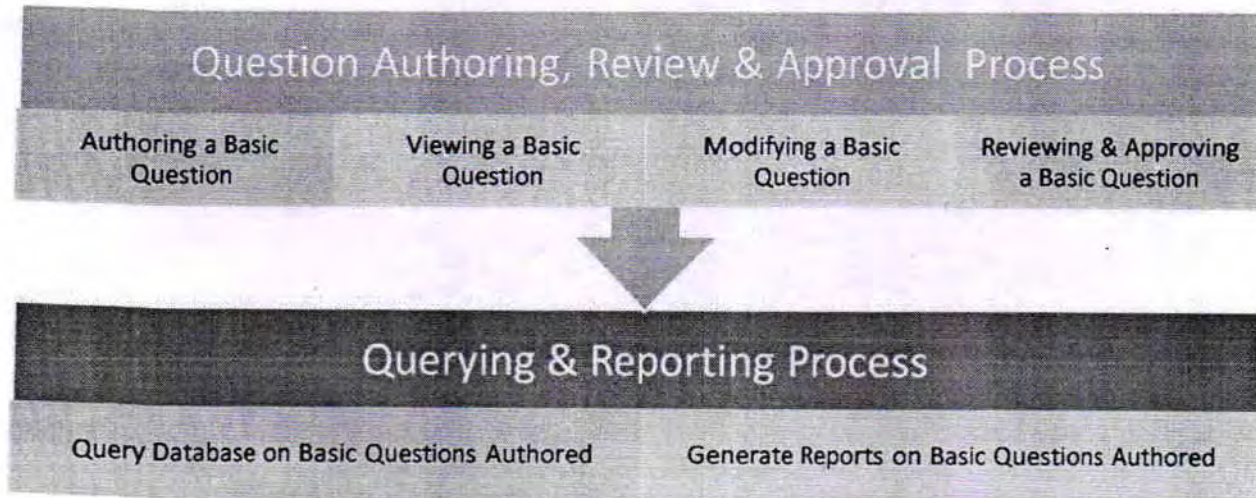
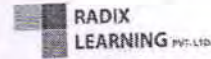


Figure 2.5: Overview of BQAS Subsystem

BQAS, the Basic Question Authoring Subsystem is an application that would be primarily used by Question Authors, Question Reviewers, Chief Examiner and the DGS – apart from the administrators. This subsystem offers facility for question author to enter an question of the basic type to be ultimately be part of a large bank of questions. Basic Questions are those which are of the following types:

- Multiple choice single response
- Multiple choice multiple response
- Drag-and-drop of specific images into position
- Hotspot clicking to indicate answer
- Fill-in-the-Blank
- Matching Lists
- Numeric Responses
- Selection from a pull-down list



- Ranking in order
- Select-a-blank
- True-False response
- Yes-No response
- Word-Phrase response

The list given here is indicative of the set of possible Basic Question types. For the MEO Class IV examination in this project, the BQAS subsystem will only offer the following Basic Question types.

1. Multiple-Choice-Single-Answer
2. Multiple-Choice-Multiple-Answer
3. Fill-in-Blank (including numerical response)
4. True-False
5. Matching Lists
6. Hotspot Clicking

The SQAS subsystem allows the Question author to select a type of assessment and author a question. The saved question is subjected to a workflow process to review and finally commit the question to a database. A Question reviewer reviews a question authored. The Question Reviewer can approve the question as-is, and the question gets committed to a database. The Question Reviewer can seek clarifications from the Question Author. The Question Reviewer has the capability to reject an question. The SQAS subsystem provides the facility to maintain the workflow and helps manage the process of authoring, review and final commitment of the question into the database.

The SQAS subsystem offers facilities for the reviewer or the author to browse only those Questions reviewed or authored by them and no other. The subsystem offers facility to search, order, choose and act upon an question.

In addition, the SQAS subsystem offers facilities to perform administrative activities such as querying, generating reports, and managing the database.

In this project a databank of 500 basic questions, for each of the papers of MEO Class IV would be developed and delivered. The system, however, will be capable of accommodating large numbers of questions of each of the Basic Question types.

2.3.4 SQAS Special Question Authoring Subsystem

The Special Question Authoring Subsystem, called SQAS, performs nearly all the functions of the Basic Question Authoring Subsystem but restricts to the authoring, review and storage of Special Questions only. Special Questions are defined in the project as those questions that are not stored as individual questions in a database. Instead, Special Questions are software modules that enable generating questions on-the-fly. In a manner, Special Questions may be called "Question Generators".

To illustrate this, assume that one of the assessments is on the candidate's ability to evaluate an electrical circuit as shown in Figure 2.4 and provide the result. Do note that this is only for illustrative purposes and this particular illustration is unlikely to be a direct part of the assessment of MEO Class IV.

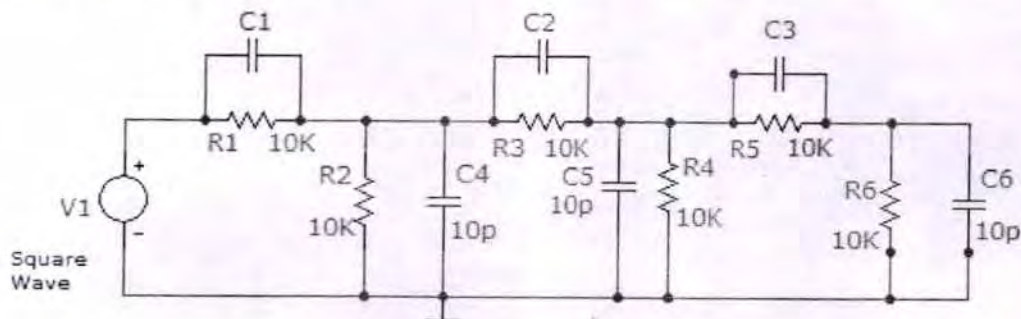


Figure 2.6: Illustrative Circuit to be used in a Question

Let us assume that such a circuit would be provided, and the candidate asked to answer the question like "Determine C1, C2 and C3 in the network show below such that it has a frequency and time independent behavior (perfect compensation)". As a Basic Question type, this sort of an question would be authored with one particular instance of the circuit as shown in Figure 2.4, above with particular values of the components. Then the candidate has to evaluate C1, C2 and C3. If 5 other questions of the same type, using the same circuit, but different values of components have to be authored, these would have to be done separately and each of these individual questions would be stored in the database. Conceivably, one would be authoring only a small number of such variations of questions based on a single circuit as above.

However, imagine that we have the ability to “specify” the components of the circuit and how they are connected as in Figure 6, and also specify the ranges of values of each component. This would mean that the specification would potentially say that the resistor R1 can have values from 1K to 30K, C4 to be 1p to 25p, and so on. The specification would also indicate what the things to be determined are. Here they are C1, C2 and C3. Now the specifications and the rules for generation of questions would be stored in the database. This is in stark contrast to the storing of individual questions in the database.

The authoring would only involve the specifications of the circuit, and the specifications of the ranges of the values of components. The question itself is not present in the database. Instead, the subsystem that creates the questions would be able to generate questions using the specifications and rules. In other words, it is now possible to generate a large number of questions based on just one circuit as in Figure 2.6, keeping the values of components within ranges specified. Indeed, it is now possible to generate a near-infinite number of questions.

This authoring facility in the DGS Competency Assessment System would place it far ahead of the ones available in the market in terms of state of art and state of practice. The biggest ROI in terms of using such special items is the ability to generate large numbers of variants of questions thereby enhancing the integrity and reliability of the assessments. Examinations generated for each candidate would then be significantly distinct, yet equivalent!

Shown here is just an illustration from a particular branch of engineering. Similar types of structural specifications and rules can be created for other branches as well.

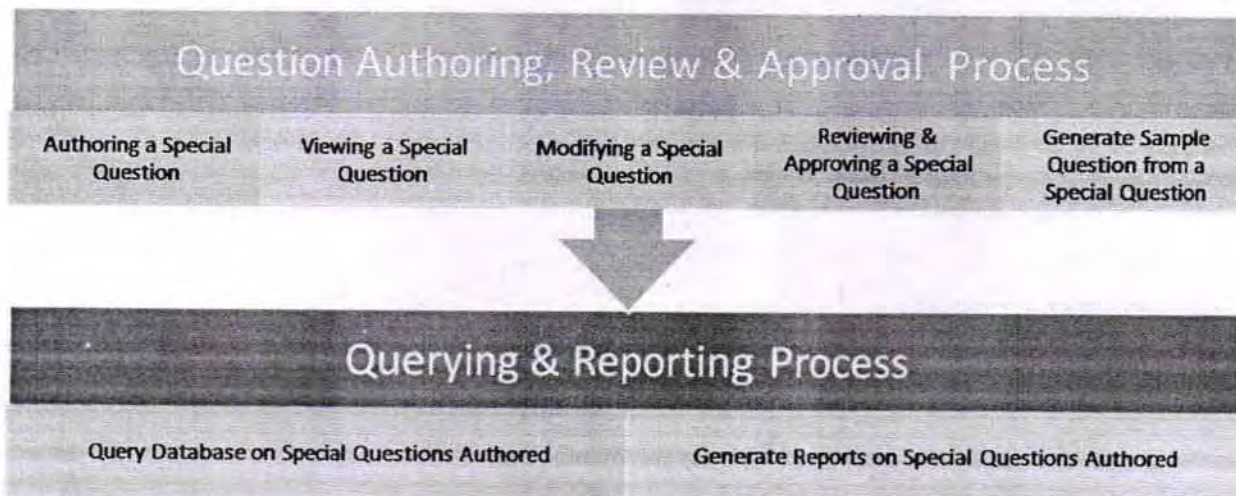
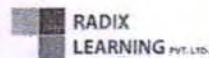


Figure 2.7: Overview of BQAS Subsystem

Yet another manifestation of Special Questions are task-centric assessments. Task-centric assessment is one in which the candidate would be required to perform a task (on the



computer system inside the examination) relevant to the examination of a topic or a competency.

In this first phase (this project as per SOW dated 7th July 2010), two (2) special question types will be developed for each paper of the MEO Class IV examination..

2.3.5 ECS – Examination Configuration Subsystem

It is now clear that the assessment system contains (a) individual questions that are authored by authorized domain experts that contain Basic Questions, and (b) questions that may be generated using the specifications and rules for question generation dynamically. Each of these are categorized as being connected with a particular competency, a level of difficulty, and the marks notionally associated with.

One of the distinctive features of the entire system is the ability to configure examination patterns from which specific examination papers would be generated, rather than the traditional way of having one single examination question paper for a paper for all candidates. The ECS or the Examination Configuration Subsystem provides this facility. The main users of the ECS are the Chief Examiner and the DGS Officers who are responsible for the preparation and conduct of the examinations.

Instead of preparing a particular examination question paper for a paper, the Chief Examiner or the DGS Officers use the ECS to create an examination pattern. An examination pattern is simply a set of rules specified using a wizard-like interface of the software.

An examination pattern, in a simple sense, may be imagined to be a specification that states

- (a) For each Basic Question type, how many Basic Questions would be used for each paper, each topic, and for each competency, along with the specification of the level of difficulty to be used, among other details.
- (b) For each Special Question type, how many Special Questions would be used for each paper, each topic, and for each competency, along with the specification of the level of difficulty to be used, among other details.

This subsystem will work with a “wizard-like” interface to enable the author to specify the rules for generation of the examination papers.

These rules form a template for an examination, which is called the examination pattern. It is from this pattern that the CERS subsystem generates an examination paper for a candidate.

The Chief Examiner and/or the DGS Officer can create new examination pattern, change an existing examination pattern, make an examination pattern active or inactive, or even retire an examination pattern. The ECS offers complete control to the Chief Examiner and the DGS Officer to manage the entire set of examination patterns.

The ECS shall offer facility to generate examination paper at any time to be able to test and evaluate whether the pattern generates papers as intended and also satisfies the condition that the coverage and the level of difficulty are equivalent.

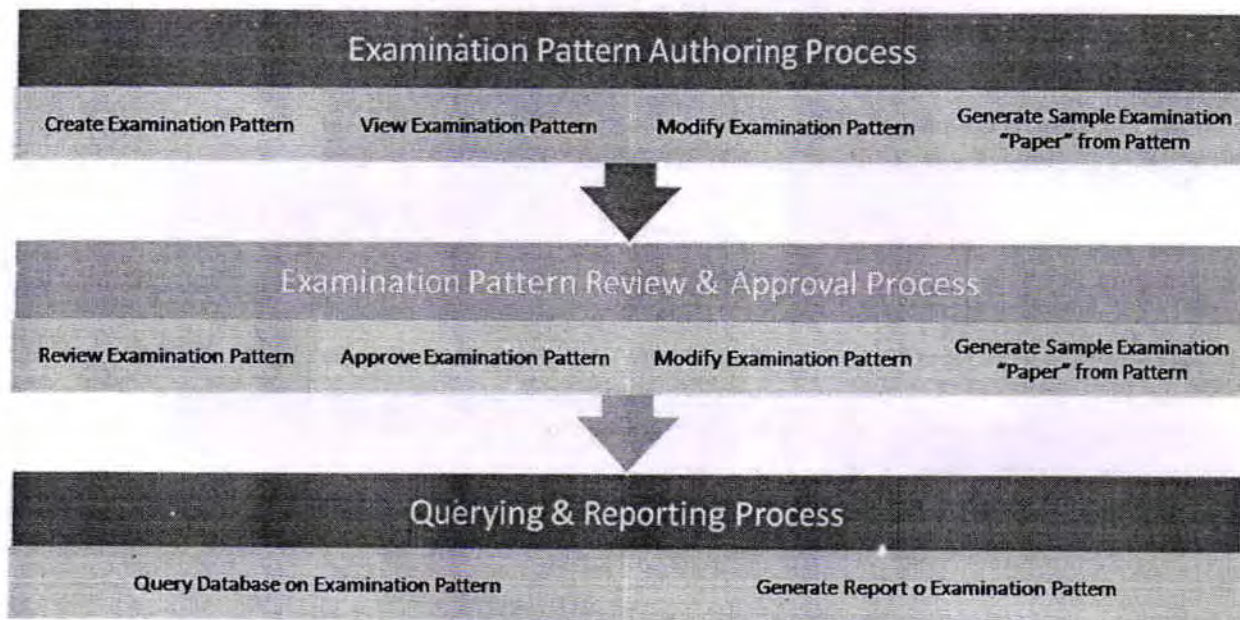


Figure 2.8: Overview of ECS Subsystem

2.3.6 ARAS – Administration, Reporting & Audit Trail Subsystem

This subsystem provides a repertoire of tools for the administration of the authoring subsystems as well as the assessment rendering subsystem described above. Apart from administration, the subsystem enables the creation, maintenance, analysis and reporting of the audit trails on the use of these specific subsystems. These tools are provided to be able to keep a sharp watch on the usage of these critical subsystems from the viewpoint of security, integrity, availability, and sanity of the databases involved.

The subsystem also provides for a set of features for the reporting of various facets of the use of the authoring subsystems as well as the assessment rendering subsystem. The examination data of the MEO Class IV needs to be made available for use by the existing software modules of DGS as a migration/integration requirement. This requirement would be handled by this subsystem by directly updating the relevant examination data of MEO Class IV into the existing database tables used by the existing software modules of DGS. Towards this, the database structure and other technical details would have to be made available by DGS.

The project envisages implementation of about 80% of the set of features for the audit trails and report generation during Phase I of the project. The remaining would be taken up during the next phase based on user experience and discussions with DGS on timelines and budgetary needs.

From the DGS, the Chief Examiner and the administrators' perspective, the ARAS or the Administration, Reporting and Audit Trails subsystem is perhaps the most important one. Some of the main features of this subsystem for administration, audit trails and reporting are shown below in Figure 2.9.

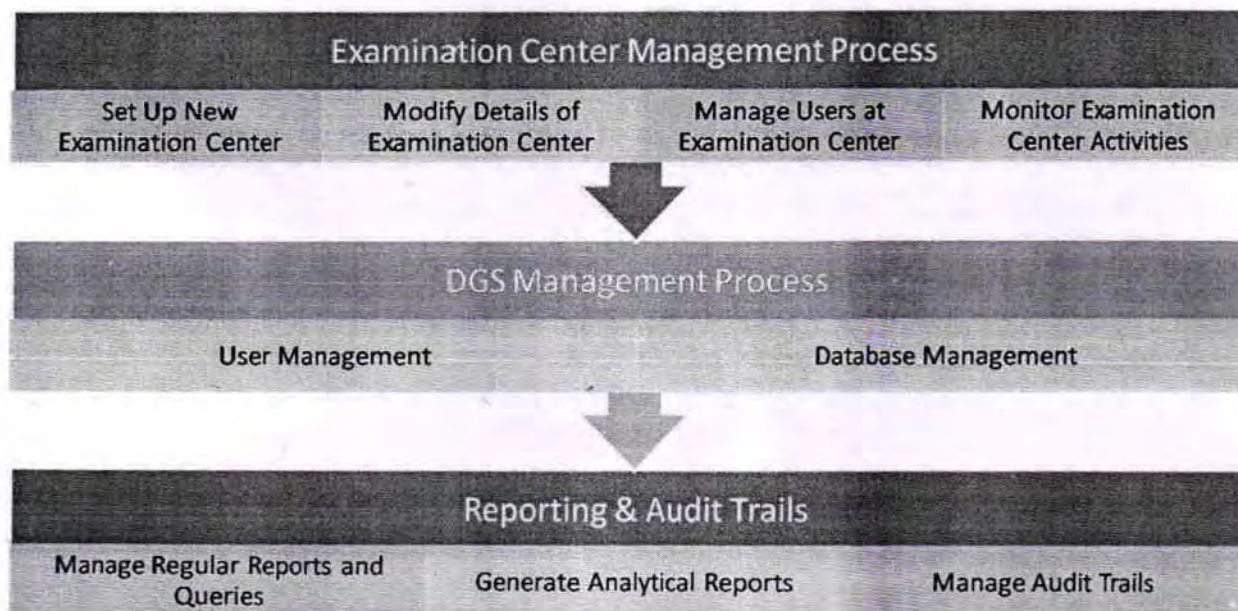


Figure 2.9: Overview of ARAS Subsystem

The ARAS subsystem allows the DGS, the Chief Examiner and the main officers of DGS to perform a wide variety of administrative tasks. These tasks include managing the various databases of candidates, applicants, the questions and the results of the examinations.

The ARAS subsystem allows querying the databases using a query-by-forms type of an interface. This allows for querying the databases in a flexible manner without having to write programs to perform specific types of queries.

The ARAS subsystem provides for a number of regular, pre-determined reports that can be generated whenever required by the users of this subsystem. The list of pre-determined reports will be available through a menu interface from which a specific report can be chosen. Section 3 articulates the specific individual, regular, pre-determined reports.

The credibility of the entire computer based assessment system rests on the security of the databank of questions, the security of the examinations, the transparency of the system, etc. The system must be capable of answering a number of queries from the public on the Right to

Information (RTI) forum or in the legislature. Every action performed on the system must be traceable to maintain security and integrity.

Thus, the ARAS subsystem maintains an exhaustive set of audit trails at the DGS, the MMDs and also at each of the Examination Centers. Apart from the regular, pre-determined reports, the ARAS system shall be flexible to perform a number of analytical tasks and generate reports based on these analytics.

Since this system forms the backbone of performing a wide range of administrative tasks, this subsystem shall function within the highest levels of security.

2.4 User Characteristics

In this subsection, we describe those general characteristics of the intended users of the product including educational level, experience, and technical expertise. We will not state specific requirements but indirectly indicate why certain specific requirements are later specified in section 3. This section is specifically to document the potential user base that will impact the design. Their experience and comfort with technology will drive UI design. Other characteristics might actually influence internal design of the system.

2.4.1 User Characteristics of CREBS

The main users of the CREBS subsystem are the applicants, candidates, the officers at DGS, MMDS, and the system administrators of DGS. Other than a few system administrators and the consultants from CDAC, it is assumed that the main users of CREBS from DGS are average users of computer applications and not expert users of computer applications. The applicants and candidates who use the CREBS system are expected to be young and technology savvy, but it is assumed that they too are average users and not expert users of computer systems.

Thus, the user interface provided shall be one that is suitable for average user of computer applications.

2.4.2 User Characteristics of CERS

The main user of CERS is the candidate who takes examination. The act of taking examination is inherently a stressful task for many candidates. Thus, the user interface of CERS shall be simple and intuitive and not add stress to the candidates. Candidates would be assumed to be averagely competent users of the computer applications, familiar with Graphical User Interfaces (GUI) based interfaces.

The exam center personnel, who are the other users of CERS have to perform some critical, sometimes, non-routine tasks. This involves dealing with extraordinary circumstances of server errors, network outages, the candidate's PC not responding, etc. The interventions required would be best performed by users who are very competent users of computer applications, if not expert users.

2.4.3 User Characteristics of BQAS

The primary users of BQAS are the Question Authors, Question Reviewers, the DGS officers and the Chief Examiner. These are domain experts and senior administrators of the examinations. The user characteristics assumed for BQAS is one of average users of computer applications, and not technology savvy users.

2.4.4 User Characteristics of SQAS

Unlike the users of BQAS, the SQAS requires users to possess a higher level of capability of quickly learning and adapting to different user interfaces. Thus the Question Authors and Question Reviewers are expected to have a higher level of competency in the use of computer applications. It is assumed that these users are quick learners.

2.4.5 User Characteristics of ECS

The ECS is one of the most distinctive and important parts of the entire system. It performs the crucial task of managing examination patterns. This task is to be performed by the senior most officers of the DGS, such as the Chief Examiner, Dy. Chief Surveyors, etc. The user characteristics assumed is one of average users of computer applications.

2.4.6 User Characteristics of ARAS

The users of ARAS range from senior most officers like DGS, Chief Examiner, Principal Officers of MMD to regular administrative-support personnel who are in charge of generating a variety of reports, to system administrators who perform some highly technical functions. For the senior most category of users and the administrative-support personnel, it is assumed that they all possess average level of computer usage capability and can be readily trained.

Those users who are to deal with analytics and special purpose report generation must possess strong technical skills including some programming experience.

2.5 Constraints

The following are some of the constraints that are likely to influence the designer and developer in achieving the requirements of the system.

1. The databank of questions developed and used in the computer based assessment system shall be in compliance with the requirements of the Standards of Training Certification and Watchkeeping for Seafarers - 95 (STCW-95) as ammended
2. The questions that comprise the examinations must be in compliance with STCW-95 as ammended, and the competencies to be assessed as stated therein.
3. All subsystems must operate under highly secure conditions. The systems shall operate under a role-based usage policy and on a need-to-know policy for the users.
4. The audit functions of the system shall be thorough, covering all subsystems, and the reporting functions flexible enough to cater to the response needs from RTI requests, candidate appeals, etc.
5. The system shall update the candidate data and the examination results data directly into the specific databases of existing applications of DGS as articulated by the DGS prior to the architecture and design functions of the project.
6. Other emerging requirements in terms of need to interface with other applications of DGS shall be dealt with the approach of exporting the relevant data in a commonly agreed upon data exporting standard like XML, CSV, etc.
7. The CREBS application shall be available to applicants and candidates on a 24 x 7 basis, with only pre-announced shutdowns for maintenance as required.
8. The CERS application at various examination centers shall be capable of running on a 24 x 7 schedule, even though in reality the examination schedule may be restricted to a subset of a working day.
9. All other subsystems shall be available for authorized users on a 24 x 7 basis except for pre-announced dates for maintenance.
10. The applications are all highly critical applications that must have very high availability, since the DGS would not be in a position to revert to the manual examinations once the computer based assessments begin.



2.6 Assumptions and Dependencies

This subsection list each of the factors that affect the requirements stated in the SRS. These factors are not design constraints on the software but are, rather, any changes to them that can affect the requirements in the SRS.

1. The candidates' examinations shall be conducted on the PCs that have at least Windows XP Professional SP3, with the latest Internet browser like Internet Explorer or Mozilla Firefox with latest plug-in for Flash & Shockwave.
2. The examinations are being prepared for the papers of MEO Class IV Part B Motor, Steam, Motor and Steam only.
3. The data export function from the system to existing applications of DGS by directly updating the relevant databases of the existing DGS applications is frozen to those prevailing databases of DGS as on 2nd August 2010.
4. The examination results of any of the papers of MEO Class IV that are conducted on the traditional, written examination basis, if any, shall be manually entered into the system for the consolidation of examination results.

2.7 Apportioning of Requirements

All the requirements stated here in Section 2, and more formally in Section 3 shall be delivered as per project plan at the end of 18 months from the start of the project.

However, based on consultations with the customer, the project plan shall envisage an iterative delivery plan of the system. The details of the iterative delivery and the apportioning of requirements among these iterative stages will be articulated in the final version of the SRS.

3. Specific Requirements

This section contains all the software requirements at a level of detail sufficient to enable designers to design a system to satisfy those requirements, and testers to test that the system satisfies those requirements. Throughout this section, every stated requirement is articulated in a manner that is externally perceivable by users, operators, or other external systems. These requirements include at a minimum a description of every input (stimulus) into the system, every output (response) from the system and all functions performed by the system in response to an input or in support of an output.

It is once again reiterated that for non-technical stakeholders of the DGS, the Section 2 states the requirements using a non-technical approach. Section 3 organizes the requirements with the focus on the designers who would design and build the system based on these requirements.

The software requirements analysis for this project is based on the Object Oriented Analysis approach using the Unified Modeling Language (UML). While there are several approaches to structuring the requirements and stating them in this section, this SRS uses a structuring more appropriate when the analysis is done based on the Object Oriented Analysis approach using the UML.

3.1 External Actor Descriptions

This subsection describes the various external actors that interact with the various subsystems of the DGS Computer Based Assessment of Competencies for MEO Class IV. A stakeholder is someone or something that has a vested interest (in a positive sense) on a specific behavior from some aspect of the various subsystems. An actor is, in a simple sense, anything that has a specific behavior. An actor might be a person, an organization, a computer program, or a computer system – hardware, software, or both.

Every actor is a stakeholder, but some stakeholders never interact with the system. For example, in this system, the Applicant, the Candidate, the Chief Examiner and the Director General of Shipping are all actors who are also stakeholders. The Secretary to the Ministry of Shipping & Surface Transport is an example of a stakeholder (who is interested in the credible functioning of the computer based examinations) who never interacts with the system, and hence not an actor.

An external actor is an entity that is not intrinsically part of the computer system, but has a certain behavior and interest in interacting with specific aspects of the computer system to elicit specific behavior from the system. These actors can be broadly classified as (a) human

actors, (b) hardware actors, and (c) software actors. The following subsections identify and list the primary actors in each of these categories.

3.1.1 Human Actors

The various human actors that interact with the specific subsystems are listed below in Figure 3.1.

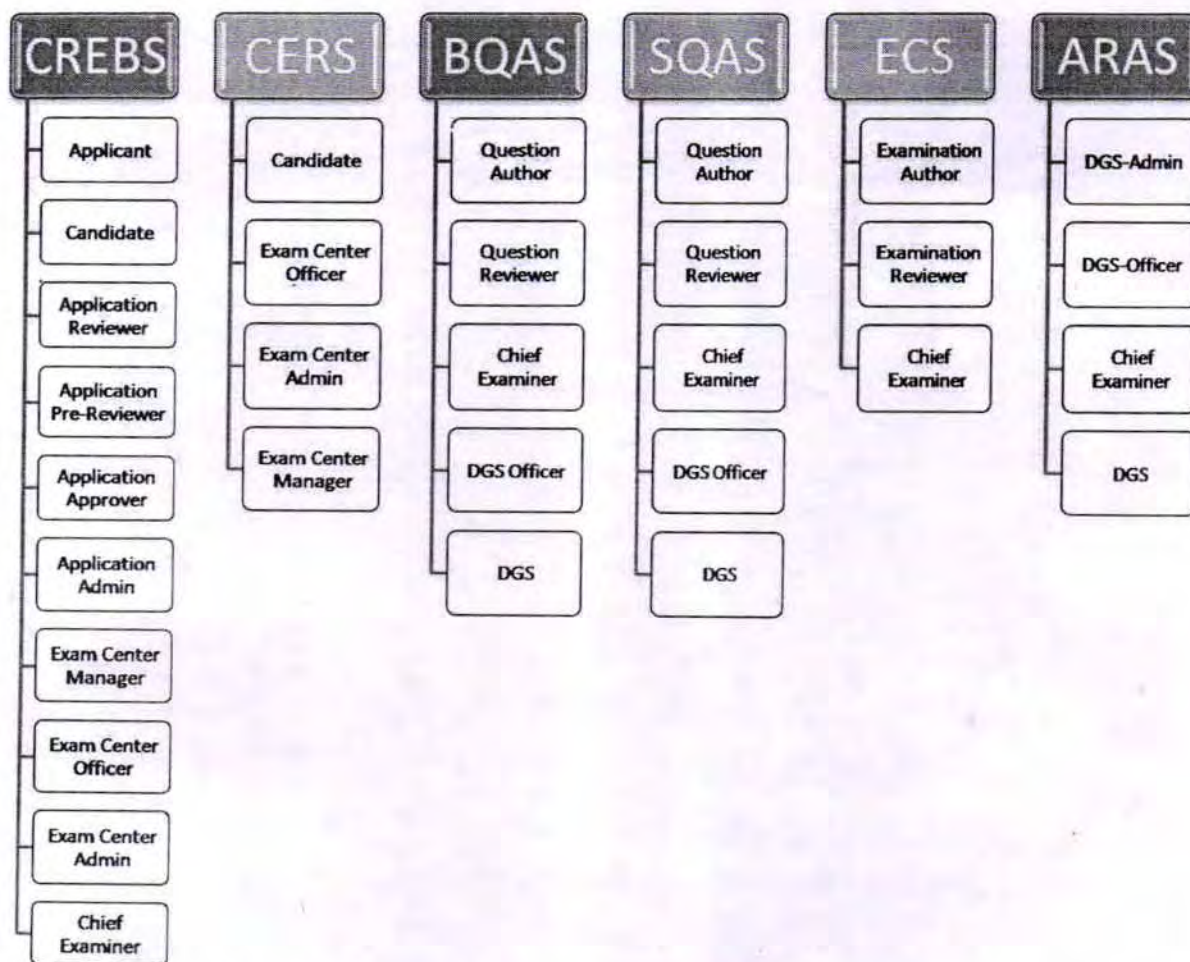


Fig. 3.1: Human Actors in the Various Subsystems

The word actor implies an individual in action. Sometimes in the context of interacting with a system, it means an individual. Sometimes it indicates the general category of individuals who can play a given role. For instance, here, the actors DGS-Officer or Examination Center Officer indicate the general category of individuals who can play a given role. The Chief Examiner or the DGS refer to individual actors.

3.1.2 Hardware Actors

There are no specific hardware actors that offer significant behavior while interacting with the various subsystems.

3.1.3 Software Actors

The various software actors that interact with the specific subsystems are listed below.

- System – CREBS
- System – CERS
- System – BQAS
- System – SQAS
- System – ECS
- System – ARAS

3.2 Use Case Descriptions

A use case captures a contract between the actors of a system about its behavior. The use case describes the system's behavior under various conditions as the system responds to a request from one of the actors who interact with it.

In this SRS document, the uses cases are summarized in specific tables for each of the 6 subsystems. The use cases themselves are documented in text form. The use cases, the use case descriptions and the use case diagrams in UML are all described in the following subsections, one for each of the 6 subsystems in this project.

3.2.1 Use Cases in CREBS

The list of various cases identified in the process of object oriented analysis of the Candidate Registration & Exam Booking Subsystem (CREBS) is described in Table 3.1 below.

Use Case ID	Subsystem	Use Case	Actor(s)
UC.A.1	CREBS	Register for the DGS portal	Applicant
UC.A.2	CREBS	Verify Registration for the DGS portal	System

UC.A.2.1	CREBS	Process Valid Registration for the DGS portal	System
UC.A.2.2	CREBS	Process Invalid Registration for the DGS portal	System
UC.A.3	CREBS	Log into the DGS portal	Applicant
UC.A.4	CREBS	Authenticate login into the DGS portal	System
UC.A.4.1	CREBS	Process Valid Login into the DGS portal	System
UC.A.4.2	CREBS	Process Invalid Login into the DGS portal	System
UC.A.5	CREBS	Submit New Application for Assessment	Applicant
UC.A.6	CREBS	View Submitted Application Form	Applicant
UC.A.7	CREBS	Print Submitted Application Form	Applicant
UC.A.8	CREBS	Update Personal Information on Application Form	Applicant, Candidate
UC.A.9	CREBS	Log into the DGS portal	Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin, Examination Center Manager, Examination Center Officer, Examination Center Admin
UC.A.10	CREBS	Display Home Page after Login	System
UC.A.10.1	CREBS	Display Applicant Home Page after Login	System
UC.A.10.2	CREBS	Display MMD Home Page after Login	System
UC.A.10.3	CREBS	Display Candidate Home Page after Login	System
UC.A.10.4	CREBS	Display Examination Center Home Page after Login	System
UC.A.10.5	CREBS	Display Examination Center Admin Home Page after Login	System
UC.A.11	CREBS	View List of New Applications	Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin
UC.A.12	CREBS	View List of Approved Applications	Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin
UC.A.13	CREBS	View List of Rejected Applications	Application Pre-Reviewer,

			Application Reviewer, Application Approver, Application Admin
UC.A.14	CREBS	View List of All Applications	Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin
UC.A.15	CREBS	Search for Specific Application	Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin
UC.A.16	CREBS	View Specific Application	Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin
UC.A.17	CREBS	Print Specific Application	Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin
UC.A.18.1	CREBS	Approve Specific Application	Application Approver
UC.A.18.2	CREBS	Reject Specific Application	Application Pre-Reviewer, Application Reviewer, Application Approver
UC.A.18.3	CREBS	Place on hold Specific Application	Application Pre-Reviewer, Application Reviewer, Application Approver
UC.A.19	CREBS	Send Email to Candidate Informing of Application Status Change	System
UC.A.20	CREBS	Make a Booking for an Exam	Candidate
UC.A.20.1	CREBS	Make a Booking for a Written Exam	Candidate
UC.A.20.2	CREBS	Make a Booking for an Oral Exam	Candidate
UC.A.21	CREBS	Modify the Booking for a Written Exam	Candidate
UC.A.22	CREBS	Cancel the Booking for a Written Exam	Candidate
UC.A.23	CREBS	View a Provisional Admit Card	Candidate
UC.A.24	CREBS	Print a Provisional Admit Card	Candidate
UC.A.25	CREBS	Address shortcomings in Application and Resubmit Application	Applicant
UC.A.26	CREBS	View Date & Time Slots at Specific Examination Center	Examination Center Manager, Examination Center Officer, Examination

			Center Admin
UC.A.27	CREBS	Print List of Date & Time Slots at specific examination center	Examination Center Manager, Examination Center Officer, Examination Center Admin
UC.A.28	CREBS	View Exam Booking Details for Exams at Specific Examination Center	Examination Center Manager, Examination Center Officer, Examination Center Admin
UC.A.29	CREBS	Print Exam Booking Details for Exams at Specific Examination Center	Examination Center Manager, Examination Center Officer, Examination Center Admin
UC.A.30	CREBS	View Utilization report for Specific Examination Center	Examination Center Manager, Examination Center Admin
UC.A.31	CREBS	Print Utilization report for Specific Examination Center	Examination Center Manager, Examination Center Admin
UC.A.32	CREBS	Add a New Date & Time Slot for at Specific Examination Center	Examination Center Admin
UC.A.33	CREBS	Set Number of Seats for a Specific Slot for a Specific Paper at Specific Examination Center	Examination Center Admin
UC.A.34	CREBS	Modify Number of Seats for a Specific Slot at Specific Examination Center	Examination Center Admin
UC.A.34.1	CREBS	Reschedule Active Bookings Affected by Modification of Number of Seats for a Specific Slot at Specific Examination Center	Examination Center Admin
UC.A.35	CREBS	Cancel a Date & Time Slot at Specific Examination Center	Examination Center Admin
UC.A.35.1	CREBS	Reschedule Active Bookings Affected by Cancellation of a Date & Time Slot at Specific Examination Center	Examination Center Admin
UC.A.36	CREBS	Perform User Account Management at Specific Examination Center	Examination Center Admin
UC.A.37	CREBS	View List of Requests for Clarification	Chief Examiner
UC.A.38	CREBS	Create Request for Clarification from MMD on Specific	Chief Examiner

		Application	
UC.A.39	CREBS	View List of Requests for Clarification	Application Approver
UC.A.40	CREBS	Provide Clarification on Specific Application to Chief Examiner	Application Approver
UC.A.41	CREBS	Request for Password to be Reset	Applicant
UC.A.42	CREBS	Reset Password	System
UC.A.43	CREBS	View List of Oral Examination Booking Requests for a Specific Exam Center	System
UC.A.44	CREBS	View a Specific Oral Examination Booking Request	System
UC.A.45	CREBS	Approve Oral Examination Booking Request	System
UC.A.46	CREBS	Reject Oral Examination Booking Request	System
UC.A.47	CREBS	View List of New Applications	Chief Examiner
UC.A.48	CREBS	View List of Approved Applications	Chief Examiner
UC.A.49	CREBS	View List of Rejected Applications	Chief Examiner
UC.A.50	CREBS	View List of All Applications	Chief Examiner
UC.A.51	CREBS	Search for Specific Application	Chief Examiner
UC.A.52	CREBS	View List of New Booking Requests for Written Exams	Application Reviewer, Application Approver
UC.A.53	CREBS	View a Specific Booking Request for Written Exams	Application Approver
UC.A.54	CREBS	Approve Specific Booking Request for Written Exams	Application Approver
UC.A.55	CREBS	Reject Specific Booking Request for Written Exams	Application Approver
UC.A.56	CREBS	Mark a Specific Candidate as Debarred	Chief Examiner
UC.A.57	CREBS	View List of Debarred Candidates	Application Pre-Reviewer, Application Reviewer, Application Approver
UC.A.58	CREBS	Submit New Application for Assessment on Behalf of Applicant	Application Pre-Reviewer, Application Reviewer

Table 3.1: List of Use Cases in CREBS

The use case descriptions for each one of the use cases as in Table 3.1 above in CREBS are given below.



UC.A.1: Register for the DGS portal (Actor: Applicant)

1. Applicant accesses DGS web portal.
2. Applicant chooses to register to the portal.
3. System displays registration form for the portal. (The registration form will collect the details for the name of the applicant, email address and unique INDOS number assigned by DGS).
4. Applicant fills registration form and submits.

UC.A.2: Verify Registration for the DGS portal (Actor: System)

This use case is triggered by UC.A.1 (Register for the DGS portal).

1. System validates the values submitted for the various fields. DGS needs to define the validation rules for this step.

UC.A.2.1: Process Valid Registration for the DGS portal (Actor: System)

This use case is triggered by UC.A.2 (Verify Registration for the DGS portal).

Here, all the fields submitted by the applicant for registration into the DGS portal are valid.

1. System creates a unique registration id for the applicant and adds the applicant as a user in the system.
2. System generates a password for the applicant.
3. System sends the password to applicant through email asking applicant to activate the registration by clicking on a link in the email.
4. Applicant clicks on the link in the email to activate registration.
5. System activates the registration by setting the applicant as an active user in the system.

UC.A.2.2: Process Invalid Registration for the DGS portal (Actor: System)

1. This use case is triggered by UC.A.2 (Verify Registration for the DGS portal).
2. Here, one or more of the fields submitted for registration into the DGS portal are invalid.
3. System displays the registration form, with the fields filled in by the user and indicates the errors found.
4. Applicant resubmits the registration form after making the necessary changes.
5. System performs the verification of the updated registration information.

UC.A.3: Log into the DGS portal (Actor: Applicant)

1. Applicant accesses DGS web portal.
2. System displays portal login page.
3. Applicant fills his/her credentials (already sent by the system through email) and submits.

UC.A.4: Authenticate Login into the DGS portal (Actor: System)

This use case is triggered by UC.A.3 or UC.A.9.

1. System authenticates the user id and password as submitted by the user attempting login.

UC.A.4.1: Process Valid Login into the DGS portal (Actor: System)

This use case is triggered by UC.A.4 (Authenticate Login into the DGS portal).

Here, all the fields submitted by the Actor for login into the DGS portal are valid.

1. System logs the Actor into the system
2. System displays Actor's home page. Each Actor will have a personalized home page.

UC.A.4.2: Process Invalid Login into the DGS portal (Actor: System)

This use case is triggered by UC.A.4 (Authenticate Login into the DGS portal).

Here, either the userid or password submitted for login into the DGS portal is invalid.

1. System displays the login form, with the userid filled and indicates that an error was encountered during login (Message: "Invalid userid or password").
2. Actor attempting login can resubmit the login form after correcting the fields.
3. System performs the authentication using the updated fields.

UC.A.5: Submit New Application for Assessment (Actor: Applicant)

1. Applicant chooses "Submit New Application for Assessment" option to fill up online application form.
2. System displays online application form.



3. Applicant fills online application form by entering data into the various designated fields of the form.
4. Applicant submits the form on completing the data entry.
5. System performs validation checks on specific fields, accepts the data and stores it in the database.
6. System generates a confirmation of online application form submission on the browser.
7. Applicant receives confirmation of online application form submission through email.

UC.A.6: View Submitted Application Form (Actor: Applicant)

Applicant selects "View Submitted Application Form" option

1. System displays the Application Form, with details filled by applicant (in a non-editable mode). This is purely a display function for viewing. The actions that can be initiated by the applicant in this case are "Print Submitted Application Form" and "Update Personal Information on Application Form".

UC.A.7: Print Submitted Application Form (Actor: Applicant)

1. Applicant selects "Print Submitted Application Form" option
2. System prints Application form, with details filled by applicant.

UC.A.8: Update Personal Details on Application Form (Actor: Applicant, Candidate)

1. Applicant/Candidate can choose to modify certain personal information fields in the Online Application to update certain data fields arising from changed circumstances e.g. change in telephone number, change in residence address, change in marital status, etc.
2. Applicant/Candidate selects "Update Personal Information on Application Form" option
3. System displays the Application Form, with specific fields enabled for modification (e.g. address, phone number, marital status, etc).
4. Applicant/Candidate modifies one or more of these fields and resubmits Application form.
5. System performs validation on the modified fields.
6. System updates the database.

UC.A.9: Log into the DGS portal (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin,

Examination Center Manager, Examination Center Officer, Examination Center Admin)

1. Actor accesses DGS web portal.
2. System displays portal login page.
3. Actor enters his/her credentials (userid, password and role) and submits. The credentials are submitted through a secure https connection.

UC.A.10: Display Home Page after Login (Actor: System)

1. Display home page based on specific role of actor logging in.

UC.A.10.1: Display Applicant Home Page after Login (Actor: System)

1. System displays Applicant Home Page after login. Applicant Home page after login contains the following menu of options (a) Submit New Application for Assessment (b) View Submitted Application Form (c) Update Personal Details on Application Form (d) Address shortcomings and Resubmit Application.

These options may be enabled / disabled based on Application status.

UC.A.10.2: Display MMD Home Page after Login (Actor: System)

1. System displays MMD Home page after login. MMD Home page is applicable for Application Reviewer, Application Approver and Application Admin. MMD Home page contains the following menu of options (a) View New Applications (b) View Approved Applications (c) View Rejected Applications (d) View All Applications (e) Search for Specific Application.

UC.A.10.3: Display Candidate Home Page after Login (Actor: System)

1. System displays Candidate Home Page after login. Candidate Home page after login contains the following menu of options (a) View Submitted Application Form (b) Update Personal Details on Application Form (c) Make a Booking for an Exam (d) Modify the Booking for an Exam (e) Cancel the Booking for an Exam (f) View Provisional Admit Cards

These options may be enabled / disabled based on status of Candidate and status of bookings.

UC.A.10.4: Display Examination Center Home Page after Login (Actor: System)

1. System displays Examination Center Home page after login. Examination Center Home page is applicable for Examination Center Manager, Examination Center Officer and Examination Center Admin. Examination Center Home page contains the following menu of options (a) View Date and Time Slots (b) View Exam Booking Details (c) View Utilization Report

These options may be enabled / disabled based on User role.

UC.A.10.5: Display Examination Center Admin Home Page after Login (Actor: System)

1. System displays Examination Center Admin Home page after login. Examination Center Home page contains the following menu of options (a) View Date and Time Slots (b) View Exam Booking Details (c) View Utilization Report (d) Manage Users (e) Perform Backup (f) Perform Restore

UC.A.10.6: Display DGS Home Page after Login (Actor: System)

1. System displays DGS Home page after login. DGS Home page is applicable for Chief Examiner. DGS Home page contains the following menu of options (a) View New Applications (b) View Approved Applications (c) View Rejected Applications (d) View All Applications (e) Search for Specific Application.

UC.A.11: View List of New Applications (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin)

This use case is triggered by UC.A.10.2.

1. Actor chooses the "View New Applications" option.
2. System displays a list of new applications pending approval for the specific MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Application Id can be used to view

application details and process as required. The results page will be paginated, with 25 candidates per page.

UC.A.12: View List of Approved Applications (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin)

This use case is triggered by UC.A.10.2.

1. Actor chooses the "View Approved Applications" option.
2. System displays a list of approved applications for the specific MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Application Id can be used to view application details and process as required. The results page will be paginated, with 25 candidates per page.

UC.A.13: View List of Rejected Applications (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin)

This use case is triggered by UC.A.10.2.

1. Actor chooses the "View Rejected Applications" option.
2. System displays a list of rejected applications for the specific MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Application Id can be used to view application details and process as required. The results page will be paginated, with 25 candidates per page.

UC.A.14: View List of All Applications (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin)

This use case is triggered by UC.A.10.2.

1. Actor chooses the "View All Applications" option.
2. System displays a list of all applications for the specific MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Application Id can be used to view



application details and process as required. The results page will be paginated, with 25 candidates per page.

UC.A.15: Search for Specific Application (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin)

This use case is triggered by UC.A.10.2.

1. Actor enters relevant data on the search field and chooses the Search option.
2. System performs the search and compiles the results.
3. System displays a list of applicants / candidates matching search criteria.

Actor can search based on Registration Id, Email id and Name. Search results page will display Registration Id, INDOS Number, Name, Email Id, Date of Application and Status of Application. The Registration Id can be used to view application details and process as required. The results page will be paginated, with 25 candidates per page.

UC.A.16: View Specific Application (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin)

This use case is triggered by UC.A.11 or UC.A.12 or UC.A.13 or UC.A.14 or UC.A.15

1. Actor chooses a specific Registration ID.
2. System displays a page containing the application details. System will display all the status change events for the application, with a record of date, time and name of Actor who made the status change.

The page will contain all relevant information about the application. It will also include the following menu of options (a) Print Application Form (b) Approve Specific Application (c) Reject Specific Application (d) Place application on-hold. These options will be enabled or disabled depending on the Actor role. Application Pre-Reviewer and Application Reviewer can only print application or reject application. Application Approver can print, reject or approve an application. Application Admin will only be able to print an application.

UC.A.17: Print Application Form of Specific Candidate (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver, Application Admin)

This use case is triggered from UC.A.16: View Specific Application.

1. Actor chooses the "Print Application Form" option.
2. System prints a copy of the application form for specific candidate selected.

UC.A.18.1: Approve Specific Application (Actor: Application Approver)

1. Actor selects "Approve Specific Application" option.
2. System seeks confirmation of action.
3. Actor confirms action.
4. System saves the status change of application to the database. System will keep track of all status change events by recording the date and time as well as the Actor who made the change.
5. System records all actions into an "Event Log" for the purposes of Audit Trail.
6. System displays a confirmation message of status change.

UC.A.18.2: Reject Specific Application (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver)

This use case is triggered from UC.A.16: View Specific Application.

1. Actor selects the "Reject Specific Application" option.
2. System seeks reason for rejection and confirmation of action.
3. Actor fills in the shortcomings in the application / reasons for rejection. This can be pre-populated with a template but editable by the Actor. Actor confirms rejection action.
4. System saves the status change of application to the database. System will keep track of all status change events by recording the date and time as well as the Actor who made the change.
5. System records all actions into an "Event Log" for the purposes of Audit Trail.
6. System displays a confirmation message of status change.

UC.A.18.3: Place on hold Specific Application (Actor: Application Pre-Reviewer, Application Reviewer, Application Approver)

This use case is triggered from UC.A.16: View Specific Application.

7. Actor selects the "Place Application On-Hold" option.
8. System seeks reason for placing the application on hold and confirmation of action.

9. Actor fills in the shortcomings in the application. This can be pre-populated with a template but editable by the Actor. Actor confirms place on-hold action.
10. System saves the status change of application to the database. System will keep track of all status change events by recording the date and time as well as the Actor who made the change.
11. System records all actions into an "Event Log" for the purposes of Audit Trail.
12. System displays a confirmation message of status change.

UC.A.19: Send Email to Candidate Informing of Application Status Change (Actor: System)

This use case is triggered from UC.A.18: Change Application Status of Specific Candidate

1. System sends an email to the candidate informing him/her of the change in the status for his/her application. The information in the email will be as follows:
2. If status is changed to "Approved Application", system sends an email to candidate to inform that his/her application has been approved and next steps if any.
3. If status is changed to "Rejected Application", system sends an email to the candidate to inform that his/her application has been rejected, the reasons for the same and next steps (if any).
4. If status is changed to "Place on-hold", system sends an email to the candidate to inform that his/her application has been placed on-hold, the reasons for the same and next steps (if any).

UC.A.20: Make a Booking for an Exam (Actor: Candidate)

This use case is triggered from UC.A.10.3: Display Candidate Home Page after Login

1. Candidate selects the "Make a Booking for an Exam" option
2. System displays a list of papers and the status against each paper, with an ability to select one of the papers. The status for the papers can be one of Cleared, Failed, Not Attempted and Scheduled. System also displays a list of Examination Centers available. Candidate can choose to make a booking for a written exam or an oral exam.

UC.A.20.1: Make a Booking for a Written Exam (Actor: Candidate)

This use case is triggered from UC.A.20: Make a Booking for an Exam

1. Candidate selects to book a slot for a written exam paper. Candidate can only select a paper if the status is Failed or Not Attempted. Candidate will not be able to select a paper if the status is Cleared or Booked.
2. System displays a list of available examination centres.
3. Candidate chooses a specific centre and submits.
4. System displays a list of available exam slots (date and time) for the selected paper in the selected Examination Center.
5. Candidate chooses a slot from the list of available slots and submits.
6. System displays a field for the Candidate to enter the receipt number for the exam fee payment
7. Candidate enters the receipt number for the exam fee payment and submits.
8. System displays the details of the selection – Registration Id, Name of Candidate, Email Id, Paper, Date and Time selected, Examination Center, etc. System seeks confirmation from Candidate.
9. Candidate confirms all the data and submits.
10. System commits the exam slot for the candidate for the specified paper in the database.
11. System creates a Provisional Admit Card for the candidate for the selected slot and paper.
12. System displays the Provisional Admit Card for the exam.
13. System sends the Provisional Admit Card to Candidate via email.

UC.A.20.2: Make a Booking for an Oral Exam (Actor: Candidate)

This use case is triggered from UC.A.20: Make a Booking for an Exam

1. Candidate selects to book a slot for an oral exam. Candidate can only select a oral if the status is Failed or Not Attempted. Candidate will not be able to select a oral if the status is Cleared or Booked.
2. System displays a list of available examination centres.
3. Candidate chooses a specific centre and submits.
4. System displays calendar month options for which booking request can be made.
5. Candidate chooses a specific calendar month and submits.
6. System displays a field for the Candidate to enter the receipt number for the exam fee payment

7. Candidate enters the receipt number for the exam fee payment and submits.
8. System displays the details of the selection – Registration Id, Name of Candidate, Email Id, Oral Exam, Month selected, Examination Center, etc. System seeks confirmation from Candidate.
9. Candidate confirms all the data and submits request.
10. System sends the request for oral exam slot to Examiner of Engineers.
11. System displays a message to the candidate with a summary of the request submission and with a message that the Examiner of Engineers will communicate back to the candidate with the booking date and timeslot.

UC.A.21: Modify the Booking for a Written Exam (Actor: Candidate)

This use case is triggered from UC.A.10.3: Display Candidate Home Page after Login

1. Candidate selects the “Modify the Booking for an Exam” option
2. System displays a list of papers which have the “Booked” status. Of these, a Candidate can select to modify an exam only if the number of days between current date and the exam date is more than X days (X is a parameter that can be configured by the Examination Center Admin).
3. Candidate selects a paper from the list and submits.
4. System displays a list of Examination Centers.
5. Candidate selects an Examination Center and submits.
6. System displays a list of alternate exam slots (date and time) for the selected paper in the selected Examination Center.
7. Candidate chooses a slot from the list of available slots and submits.
8. System displays the details of the selection – Registration Id, Name of Candidate, Email Id, Paper, New Date and Time selected, Examination Center, etc. System seeks confirmation from Candidate for the modification.
9. Candidate confirms all the data and submits.
10. System cancels the old exam slot for the candidate for the specified paper in the database.
11. System commits the exam slot for the candidate for the specified paper in the database.
12. System creates a Provisional Admit Card for the candidate for the selected slot and paper.
13. System displays the Provisional Admit Card for the exam.
14. System sends the Provisional Admit Card to Candidate via email.

UC.A.22: Cancel the Booking for a Written Exam (Actor: Candidate)

This use case is triggered from UC.A.10.3: Display Candidate Home Page after Login

1. Candidate selects the "Cancel the Booking for an Exam" option
2. System displays a list of papers which have the "Booked" status. Of these, a Candidate can select to modify an exam only if the number of days between current date and the exam date is more than X days (X is a parameter that can be configured by the Examination Center Admin).
3. Candidate selects a paper from the list.
4. System displays the details of the selection – Registration Id, Name of Candidate, Email Id, Paper, Date and Time selected, Examination Center, etc. System seeks confirmation from Candidate for canceling the slot.
5. Candidate confirms the cancellation and submits.
6. System displays the cancellation confirmation.
7. System sends the cancellation confirmation to Candidate via email.

UC.A.23: View a Provisional Admit Card (Actor: Candidate)

This use case is triggered from UC.A.10.3: Display Candidate Home Page after Login. A Provisional Admit Card is only a temporary confirmation document to the candidate. Candidates will then receive a final Admit card (with their photo attached) from the respective MMDs. These final Admit Cards should be used on the date of the examination.

1. Candidate selects the "View a Provisional Admit Card" option
2. System displays a list of papers which have the "Scheduled" status.
3. Candidate selects a paper from the list and submits.
4. System displays the Provisional Admit Card for selected paper, specifying the Examination Center, date and time, time of reporting, etc. Provisional Admit Cards can be viewed for Written exams as well as for Oral exams.
5. System provides an option to print the Provisional Admit Card.

UC.A.24: Print a Provisional Admit Card (Actor: Candidate)

This use case is triggered from UC.A.23: View a Provisional Admit Card

1. Candidate selects the "Print the Provisional Admit Card" option
2. System prints the Provisional Admit Card for selected paper, specifying the Examination Center, date and time, time of reporting, etc.

UC.A.25: Address Shortcomings in Application and Resubmit Application (Actor: Applicant)

This use case is triggered from UC.A.10.1: Display Applicant Home Page after Login

1. Applicant can choose to modify certain fields in Online Application Form in response to the intimation on shortcomings in Application Form from the MMD.
2. Applicant selects the "Address shortcomings and Resubmit Application" option
3. System displays the submitted Application Form, with an indication of shortcomings. The fields that have shortcomings will be editable.
4. Applicant modifies specific fields with new data addressing the specific shortcomings based on which his/her application.
5. Applicant resubmits the modified application form.
6. System performs validation on specific fields of the form, and updates the database.
7. System sends Applicant through email confirmation that the application form has been resubmitted.

UC.A.26: View Date & Time Slots at Specific Examination Center (Actor: Examination Center Manager, Examination Center Officer, Examination Center Admin)

1. Actor chooses to view date and time slots for bookings at specific examination center.
2. System displays a calendar to allow Actor to choose a "From" date and a "To" date.
3. Actor chooses specific date or a range of dates.
4. System displays set of date & time slots as well as the number of seats for the specified slot at the specific examination center for the selected date range.
5. System will display "Modify Number of Seats" and "Cancel Exam Slot" options against each date & time slot.
6. System will also include the following option on the page: "Print List of Date & Time Slots".
7. System will also include the following option on the page: "Add a New Date & Time slot".
This option will be enabled only for the Examination Center Admin.

UC.A.27: Print List of Date & Time Slots at Specific Examination Center (Actor: Examination Center Manager, Examination Center Officer, Examination Center Admin)

This use case is triggered from UC.A.26: View Date & Time Slots at Specific Examination Center.

1. Actor chooses the "Print Date & Time Slots" option
2. System prints a copy of the date and time slots for the specific examination center for the selected date range as described in UC.A.26.

***UC.A.28: View Exam Booking Details at Specific Examination Center
(Actor: Examination Center Manager, Examination Center Officer,
Examination Center Admin)***

1. Actor chooses to view booking details for exams at their own center only.
2. System displays a calendar to allow Actor to choose a "From" date and a "To" date.
3. Actor chooses specific date or a range of dates.
4. System displays a detailed table, with each row listing the following fields: Booking Id, Name of Candidate, Date and Time Slot, Paper Selected, etc.
5. System also displays an option "Print Exam Booking Details".

***UC.A.29: Print Exam Booking Details at Specific Examination Center
(Actor: Examination Center Manager, Examination Center Officer,
Examination Center Admin)***

This use case is triggered from UC.A.28: View Exam Booking Details at Specific Examination Center.

1. Actor chooses the "Print Exam Booking Details" option.
2. System prints a copy of the summary table report as described in UC.A.28.

***UC.A.30: View Utilization Report at Specific Examination Center (Actor:
Examination Center Manager, Examination Center Officer, Examination
Center Admin)***

1. Actor chooses to view utilization report for exams at their own center only.
2. System displays a calendar to allow Actor to choose a "From" date and a "To" date.
3. Actor chooses specific date or a range of dates.



4. System displays a utilization report, with each row listing the following fields: Specific Date and Time Slot, Number of Seats Booked and the Number of Seats left unused/available for booking.
5. System also displays an option "Print Utilization Report".

UC.A.31: Print Utilization Report at Specific Examination Center (Actor: Examination Center Manager, Examination Center Officer, Examination Center Admin)

This use case is triggered from UC.A.30: View Utilization Report at Specific Examination Center.

1. Actor chooses the "Print Utilization Report" option.
2. System prints a copy of the utilization report as described in UC.A.30.

UC.A.32: Add a New Date & Time Slot at Specific Examination Center (Actor: Examination Center Admin)

This use case is triggered from UC.A.26: View Date & Time Slots at Specific Examination Center.

1. Actor chooses the "Add a New Date & Time Slot" option.
2. System displays a calendar allowing the Actor to select a Date.
3. Actor selects a Date.
4. System displays a set of Time slots that are not currently included for the selected date for the specific examination center.
5. Actor selects a Time slot and submits.
6. System adds the new date & time slot selected to the database.

There will be three Time slots options for each day. The suggested timings for the slots are: Morning (10 am to 12pm), Afternoon (1 pm to 3pm) and Evening (4 pm to 6 pm). The timings for each slot will be made configurable by the DGS Admin.

UC.A.33: Set Number of Seats for Specific Slot at Specific Examination Center (Actor: Examination Center Admin)

This use case is triggered from UC.A.32: Add a New Date & Time Slot at Specific Examination Center.

1. System displays a field for Actor to select the number of seats to be made available for a specific date & time slot.
2. Actor selects the number of seats to be made available and submits.
3. System updates the number of seats for the selected date & time slot.

UC.A.34: Modify Number of Seats for Specific Slot at Specific Examination Center (Actor: Examination Center Admin)

This use case is triggered from UC.A.26: View Date & Time Slots at Specific Examination Center.

1. System displays the current details for the selected slot.
2. System displays a field for Actor to select the modified number of seats to be made available for a specific date & time slot. System also displays a field requiring the reason for the modification.
3. Actor selects the modified number of seats to be made available. Actor also enters the reason for the modification and submits to confirm the modification.
4. System updates the number of seats for the selected date & time slot.
5. System checks if the number of active bookings for the selected slot is higher than the modified number of seats.
6. If the number of active bookings exceeds the modified number of seats, the system raises an alert and indicates to the Actor that he/she will need to reschedule some of the active bookings for the specified slot.

UC.A.34.1: Reschedule Active Bookings Affected by Modification of Number of Seats for a Specific Slot at Specific Examination Center (Actor: Examination Center Admin)

This use case is triggered from UC.A.34: Modify Number of Seats for Specific Slot at Specific Examination Center. When the number of seats for a specific slot is modified (specifically when it is reduced), the number of active bookings for that slot may exceed the modified number of seats. When this happens, the Examination Center Admin has to reschedule some of the bookings to a different slot in consultation with the Candidates.

1. System displays the list of active bookings for the selected slot in ascending order of date and time at which booking was done.
2. System displays a "Reschedule booking" option against each of the active bookings.



3. Actor consults with candidates (over the phone or email), informs them about the event and confirms an alternate date and time slot that is convenient to the candidates.
4. Actor selects the "Reschedule" option against any one of the candidates who need to be rescheduled.
5. System displays candidate name, paper, booking id and current date & time slot.
6. System displays a list of other date & time slots, with number of seats available against each of them. System also displays a notes section where the Actor can fill any additional information that they wish to share with the candidate.
7. Actor selects a new date & time slot for the candidate, fills in any additional information in the notes field and submits.
8. System updates the database with the new slot as well as the notes filled by the Actor.
9. System sends a confirmation email to the candidate informing them of the change in their slot, the reason for the change, all details about their new slot as well as any additional notes filled by the Actor.
10. System displays the list of active bookings for the selected slot, with the rescheduled information updated in the list.

UC.A.35: Cancel a Specific Slot at Specific Examination Center (Actor: Examination Center Admin)

This use case is triggered from UC.A.26: View Date & Time Slots at Specific Examination Center.

1. System displays the current details for the selected slot.
2. System seeks a confirmation from the Actor that he/she wants to cancel the selected slot. System also displays a field requiring the reason for the cancellation.
3. Actor enters the reason for the cancellation and submits to confirm the cancellation.
4. System checks if there are any active bookings for the selected slot
5. If any active bookings exist for the selected slot, system raises an alert and indicates to the Actor that he/she will need to reschedule the active bookings for the specified slot.

UC.A.35.1: Reschedule Active Bookings Affected by Cancellation of a Specific Slot at Specific Examination Center (Actor: Examination Center Admin)

This use case is triggered from UC.A.35: Cancel a Specific Slot at Specific Examination Center. When a specific slot is cancelled, the Examination Center Admin has to reschedule the active bookings to a different slot in consultation with the Candidates.

1. System displays the list of active bookings for the selected slot in ascending order of date and time at which booking was done.
2. System displays a "Reschedule booking" option against each of the active bookings.
3. Actor consults with candidates (over the phone or email), informs them about the event and confirms an alternate date and time slot that is convenient to the candidates.
4. Actor selects the "Reschedule" option against any one of the candidates who need to be rescheduled.
5. System displays candidate name, paper, booking id and current date & time slot.
6. System displays a list of other date & time slots, with number of seats available against each of them. System also displays a notes section where the Actor can fill any additional information that they wish to share with the candidate.
7. Actor selects a new date & time slot for the candidate, fills in any additional information in the notes field and submits.
8. System updates the database with the new slot as well as the notes filled by the Actor.
9. System sends a confirmation email to the candidate informing them of the change in their slot, the reason for the change, all details about their new slot as well as any additional notes filled by the Actor.
10. System displays the list of active bookings for the selected slot, with the rescheduled information updated in the list.

UC.A.36: Perform User Account Management at Specific Examination Center (Actor: Examination Center Admin)

1. Actor chooses to perform user account management at specific examination center.
2. Actor can create, modify, view, and delete user accounts that are authorized to make use of CREBS in specific roles. The User accounts include that of Examination Center Admin, Examination Center Manager and Examination Center Officers.

UC.A.37: View List of Requests for Clarification (Actor: Chief Examiner)

1. Actor chooses the "View List of Requests for Clarification" option.



2. System displays a list of all requests for clarification. Actor will have the ability to filter the list down to requests from a specific MMD.

The list will display certain fields like Request Id, Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Request Id can be used to view clarification request and response (if available). The results page will be paginated, with 25 candidates per page.

UC.A.38: Create Request for Clarification from MMD on Specific Application (Actor: Chief Examiner)

1. Actor selects "Request Clarifications from MMD on Specific Application" option against a selected application.
2. System displays a form where Actor fills in the query he/she has and submits.
3. System saves the request and sends the request message to Application Approver at appropriate MMD.

UC.A.39: View List of Requests for Clarification (Actor: Application Approver)

1. Actor chooses the "View List of Requests for Clarification" option.
2. System displays a list of all requests for clarification for the specific MMD.

The list will display certain fields like Request Id, Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Request Id can be used to view complete clarification request. If a clarification has already been provided, the clarification will also be available for viewing. If clarification has not yet been provided, Actor will have ability to provide clarification for request. The results page will be paginated, with 25 requests per page.

UC.C.40: Provide Clarification on Specific Application to Chief Examiner (Application Approver)

1. Actor selects "Provide Clarification on Specific Application to Chief Examiner" in response to a request for clarification.
2. System displays a form where Actor replies to the request from the Chief Examiner and submits.
3. System saves the response and sends the response message to Chief Examiner.

UC.A.41: Request for Password to be Reset (Actor: Applicant/Candidate)

1. Applicant selects "Forgot Password" link.
2. System displays form requesting user to enter email id.
3. Applicant enters email id and submits.
4. System sends an email to the specified email id. The email will include a link that the user can click on to reset his/her password.
5. User clicks on link in the email to confirm that he/she is requesting for a password reset.

UC.A.42: Reset Password (Actor: System)

This use case is triggered from UC.A.41: Request for Password to be Reset.

1. System resets the password for the user and sends a new temporary password to the user by email.
2. System displays confirmation message on the browser indicating that the user's password has been reset and that a temporary password has been sent to him/her by email.

The use case diagrams in UML for CREBS are provided in four different use case diagrams for readability instead of in one single diagram.

The use case diagram for CREBS with the relevant actors, Applicant and Candidate is shown in Figure 3.2.

UC.A.43: View List of Oral Examination Booking Requests for a Specific Exam Center (Actor: Examiner of Engineer)

1. Actor selects 'View List of Oral Examination Booking Requests'.
2. System displays a list of all pending oral examination booking requests for the specific examination centre. The list displays the request id, candidate name, date when request was made, calendar month that exam date requested for, etc.

UC.A.44: View a Specific Oral Examination Booking Request (Actor: Examiner of Engineer)

1. Actor selects a particular oral examination booking request.
2. System displays the details of the request as well as the history of the candidate.



3. System also displays the following menu options (a) Approve Request and Assign Date/Time Slot (b) Reject Request

UC.A.45: Approve Oral Examination Booking Request (Actor: Examiner of Engineer)

1. Actor selects 'Approve Request and Assign Date/Time Slot' for a specific booking request.
2. System provides an interface for Actor to select a date and time slot (am/pm).
3. Actor selects a specific date and time slot.
4. System displays a list of examiners and provides an interface for Actor to select a specific examiner for the oral exam.
5. Actor selects a specific examiner and submits.
6. System saves the changes in the database.
7. System sends a confirmation email to the candidate informing him/her about the approval for the oral examination and the date/time slot that has been allotted to him/her.

UC.A.46: Reject Oral Examination Booking Request (Actor: Examiner of Engineer)

1. Actor selects "Reject request" for a specific booking request.
2. System provides an interface for Actor to provide the reasons for the request rejection.
3. Actor specifies the reasons for the request rejection and submits.
4. System saves the changes in the database.
5. System sends an email to the candidate informing him/her about the rejection of the booking request for the oral examination and the reasons for the same.

UC.A.47: View List of New Applications (Actor: Chief Examiner)

This use case is triggered by UC.A.10.6.

1. Actor chooses the "View New Applications" option.
2. System displays a list of MMDs.
3. Actor selects a particular MMD.
4. System displays a list of new applications pending approval for that MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Registration Id can be used to view

application details and process as required. The results page will be paginated, with 25 candidates per page.

UC.A.48: View List of Approved Applications (Actor: Chief Examiner)

This use case is triggered by UC.A.10.6.

1. Actor chooses the "View Approved Applications" option.
2. System displays a list of MMDs.
3. Actor selects a particular MMD.
4. System displays a list of approved applications for that MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Registration Id can be used to view application details and process as required. The results page will be paginated, with 25 candidates per page. System will also provide the Actor with an option against any application to "Request Clarifications from MMD on Specific Application".

UC.A.49: View List of Rejected Applications (Actor: Chief Examiner)

This use case is triggered by UC.A.10.6.

1. Actor chooses the "View Rejected Applications" option.
2. System displays a list of MMDs.
3. Actor selects a particular MMD.
4. System displays a list of rejected applications for that MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Registration Id can be used to view application details and process as required. The results page will be paginated, with 25 candidates per page. System will also provide the Actor with an option against any application to "Request Clarifications from MMD on Specific Application".

UC.A.50: View List of All Applications (Actor: Chief Examiner)

This use case is triggered by UC.A.10.6.

1. Actor chooses the "View All Applications" option.
2. System displays a list of MMDs.
3. Actor selects a particular MMD.



4. System displays a list of all applications for that MMD.

The list will display certain fields like Registration Id, Application Id, Indos Number, Name, Email Id, Date of Application and Status of Application. The Registration Id can be used to view application details and process as required. The results page will be paginated, with 25 candidates per page. System will also provide the Actor with an option against any application to "Request Clarifications from MMD on Specific Application".

UC.A.51: Search for Specific Application (Actor: Chief Examiner)

This use case is triggered by UC.A.10.6.

1. Actor enters relevant data on the search field and chooses the Search option.
2. System performs the search and compiles the results.
3. System displays a list of applicants / candidates matching search criteria.

Actor can search based on Application Id, INDOS Number and Name. Search results page will display Registration Id, Application Id, INDOS Number, Name, Email Id, Date of Application and Status of Application. The Application Id can be used to view application details and process as required. The results page will be paginated, with 25 candidates per page. System will also provide the Actor with an option against any application to "Request Clarifications from MMD on Specific Application".

UC.A.52: View List of New Booking Requests for Written Exams (Actor: Application Reviewer, Application Approver)

1. Actor chooses the "View List of New Booking Requests" option.
2. System displays a list of new bookings pending approval for the specific MMD. Actor will also have the following menu of options against each booking request (a) View a Specific Booking Request (b) Approve a Specific Booking Request (c) Reject a Specific Booking Request.

The list will display certain fields like Booking Id, Application Id, Indos Number, Name, Date of Booking and Status of Booking. The Booking Id can be used to view booking details and process as required. The results page will be paginated, with 25 bookings per page.

UC.A.53: View Specific Booking Request for Written Exams (Actor: Application Reviewer, Application Approver)

1. Actor selects the "View Specific Booking Request" option.

2. System displays a new page with Booking Id, Name of Candidate, INDOS Number and other details of the booking. These fields will not be editable. System also displays options for "Approve Specific Booking Request" and "Reject Specific Booking Request".

UC.A.54: Approve Specific Booking Request for Written Exams (Actor: Application Approver)

1. Actor selects the "Approve Specific Booking Request" option.
2. System seeks confirmation of action.
3. Actor confirms action.
4. System saves the status change of booking request to the database.
5. System displays a confirmation message of status change.
6. System sends an email to the Candidate informing them that the booking request has been approved.

UC.A.55: Reject Specific Booking Request for Written Exams (Actor: Application Reviewer, Application Approver)

1. Actor selects the "Reject Specific Booking Request" option.
2. System seeks reason for rejection and confirmation of action.
3. Actor enters the reason for rejection and confirms action.
4. System saves the status change of booking request to the database.
5. System displays a confirmation message of status change.
6. System sends an email to the Candidate informing them that the booking request has been rejected and the reasons for the same.

UC.A.56: Mark a Specific Candidate as Debarred (Actor: Chief Examiner)

1. Actor selects the "Mark a Specific Candidate as Debarred" option.
2. System displays a field where the Actor can enter an INDOS Number.
3. Actor enters INDOS Number and submits.
4. System displays Candidate Profile matching that INDOS Number. System also provides Actor with ability to choose period of debarment, reason for debarment and confirmation that candidate is being debarred.
5. Actor chooses period of debarment, enters reason for debarment and confirms action.
6. System displays a confirmation message of the debarment.



7. System sends an email to the Candidate informing them that he/she has been debarred, the period of debarment and the reasons for the same.

UC.A.57: View List of Debarred Candidates (Actor: Application Reviewer, Application Approver)

1. Actor chooses the "View List of Debarred Candidates" option.
2. System displays a list of debarred candidates

The list will display certain fields like INDOS Number, Name, Date of Debarment and Period of Debarment. The INDOS Number can be used to view complete profile of candidate. The results page will be paginated, with 10 candidates per page.

UC.A.58: Submit New Application for Assessment on Behalf of Applicant (Actor: Application Pre-Reviewer, Application Reviewer)

1. Actor chooses "Submit New Application for Assessment on Behalf of Applicant" option.
2. System displays online application form.
3. Actor fills online application form by entering data into the various designated fields of the form.
4. Actor submits the form on completing the data entry.
5. System performs validation checks on specific fields, accepts the data and stores it in the database.
6. System generates a confirmation of online application form submission on the browser.
7. System sends an email confirmation of application to the applicant.

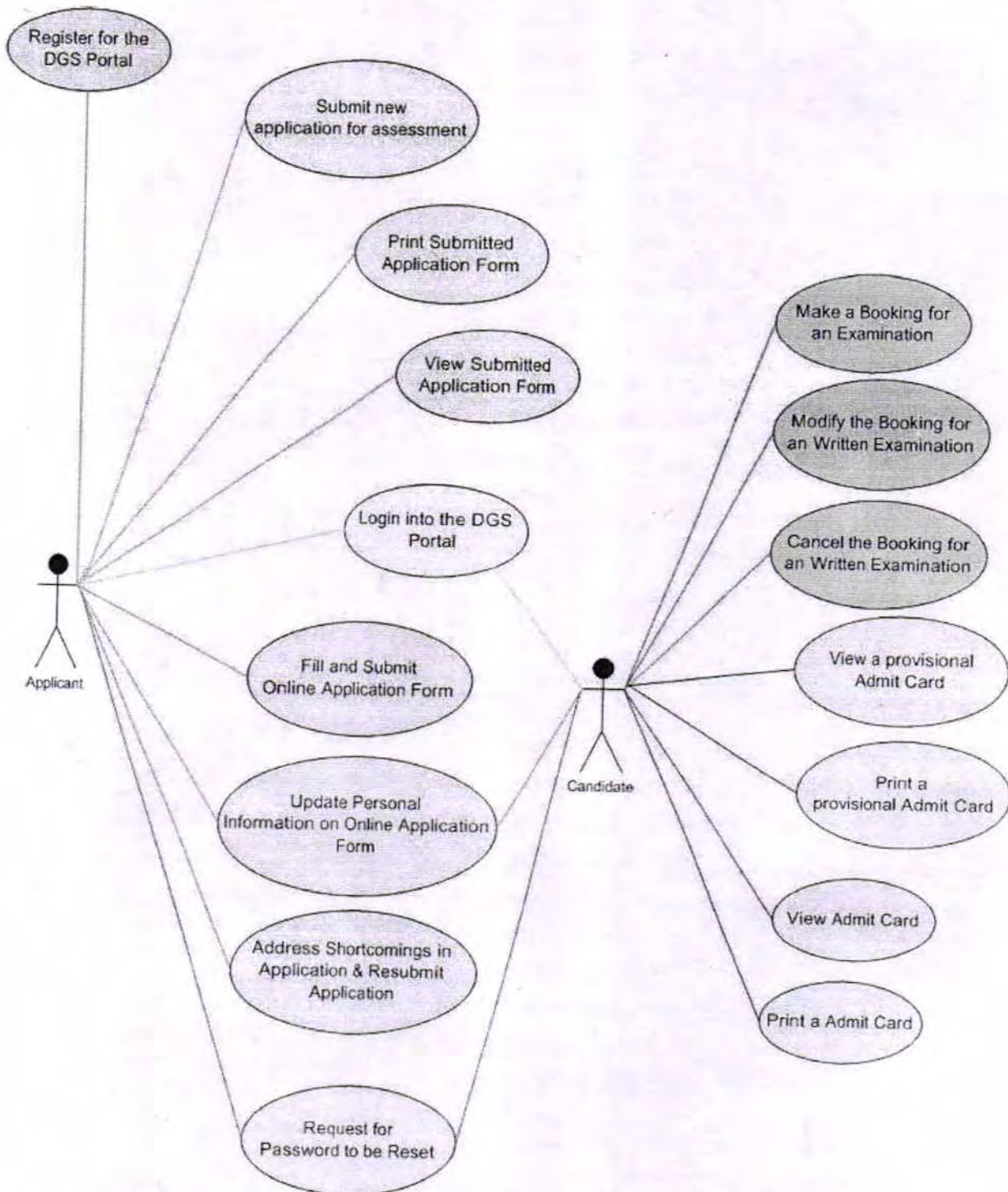


Fig. 3.2: Use Case Diagram for CREBS with Actors CANDIDATE & APPLICANT

The use case diagram for CREBS with the relevant actors – Candidate and Applicant - is shown in Figure 3.2.

The use case diagram for CREBS with the relevant actors - Application Reviewer, Application Approver and Application Admin - is shown in Figure 3.3.

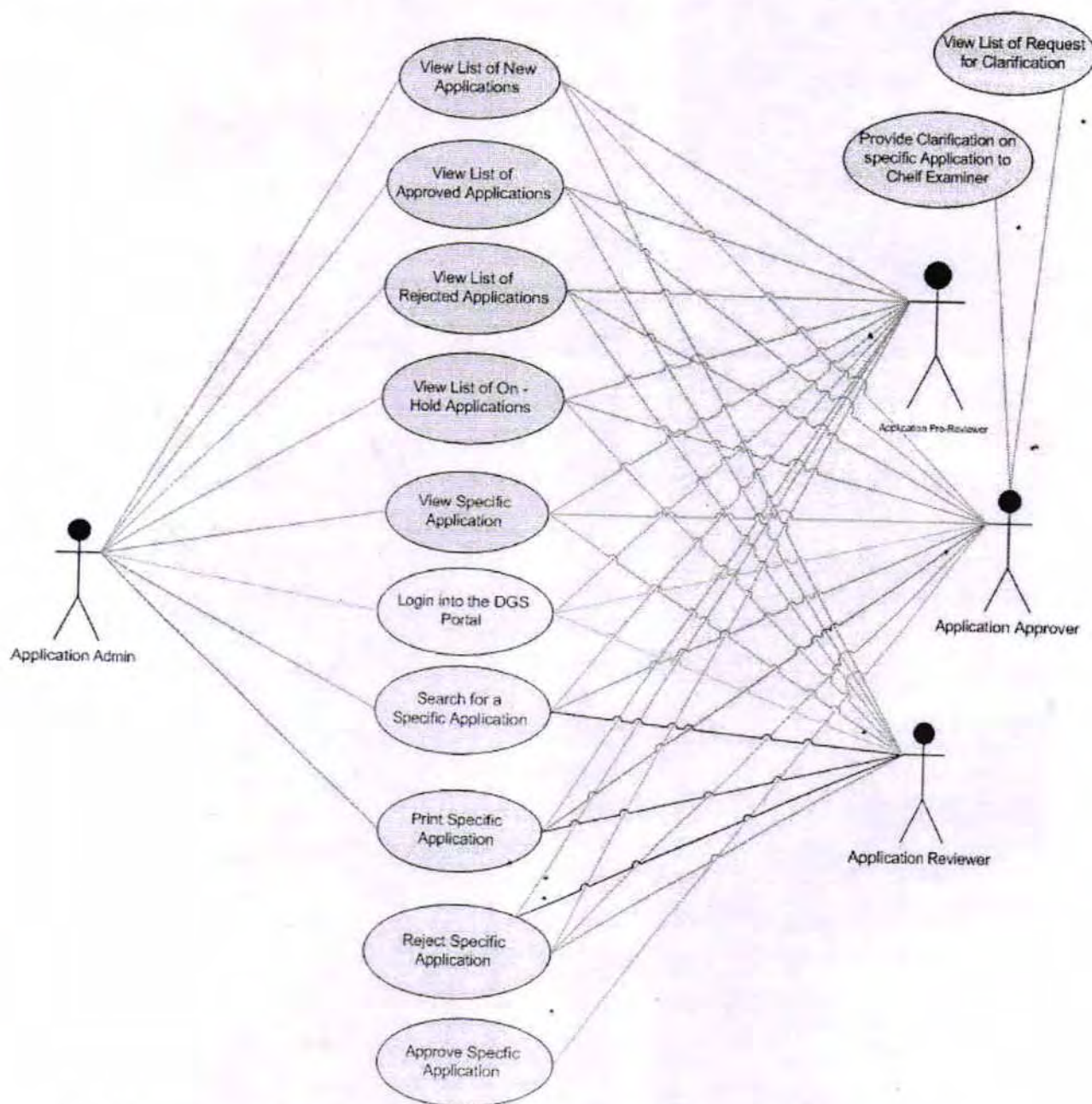


Fig. 3.3: Use Case Diagram for CREBS with Actors APPLICATION PRE-REVIEWER, APPLICATION REVIEWER, APPLICATION APPROVER & APPLICATION ADMIN

The use case diagram for CREBS with the relevant actors - Examination Center Manager, Examination Center Officer and Examination Center Admin - is shown in Figure 3.4.

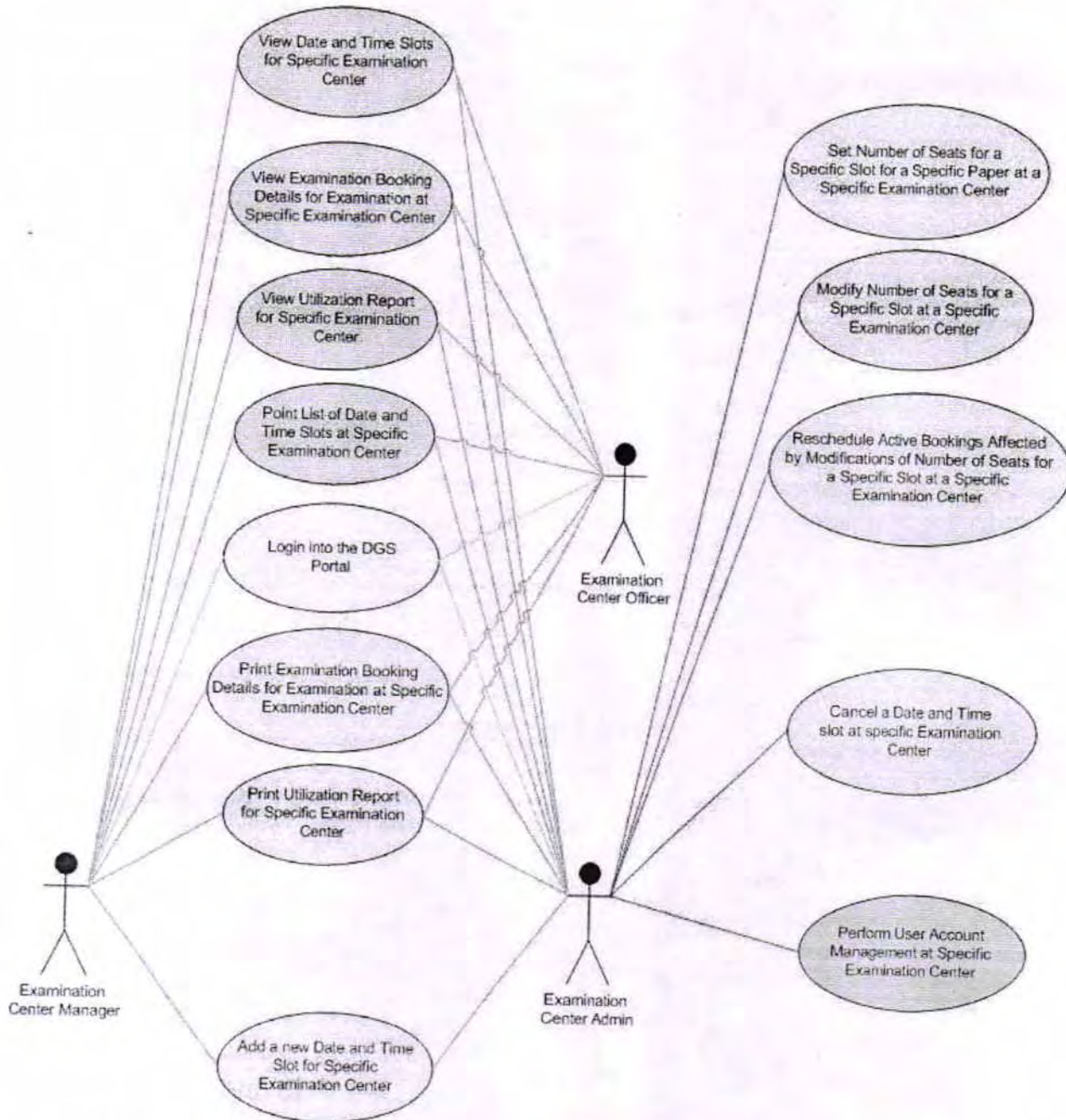


Fig. 3.4: Use Case Diagram for CREBS with Actors EXAMINATION CENTER MANAGER, EXAMINATION CENTER OFFICER & EXAMINATION CENTER ADMIN

The use case diagram for CREBS with the relevant actor System is shown in Figure 3.5.

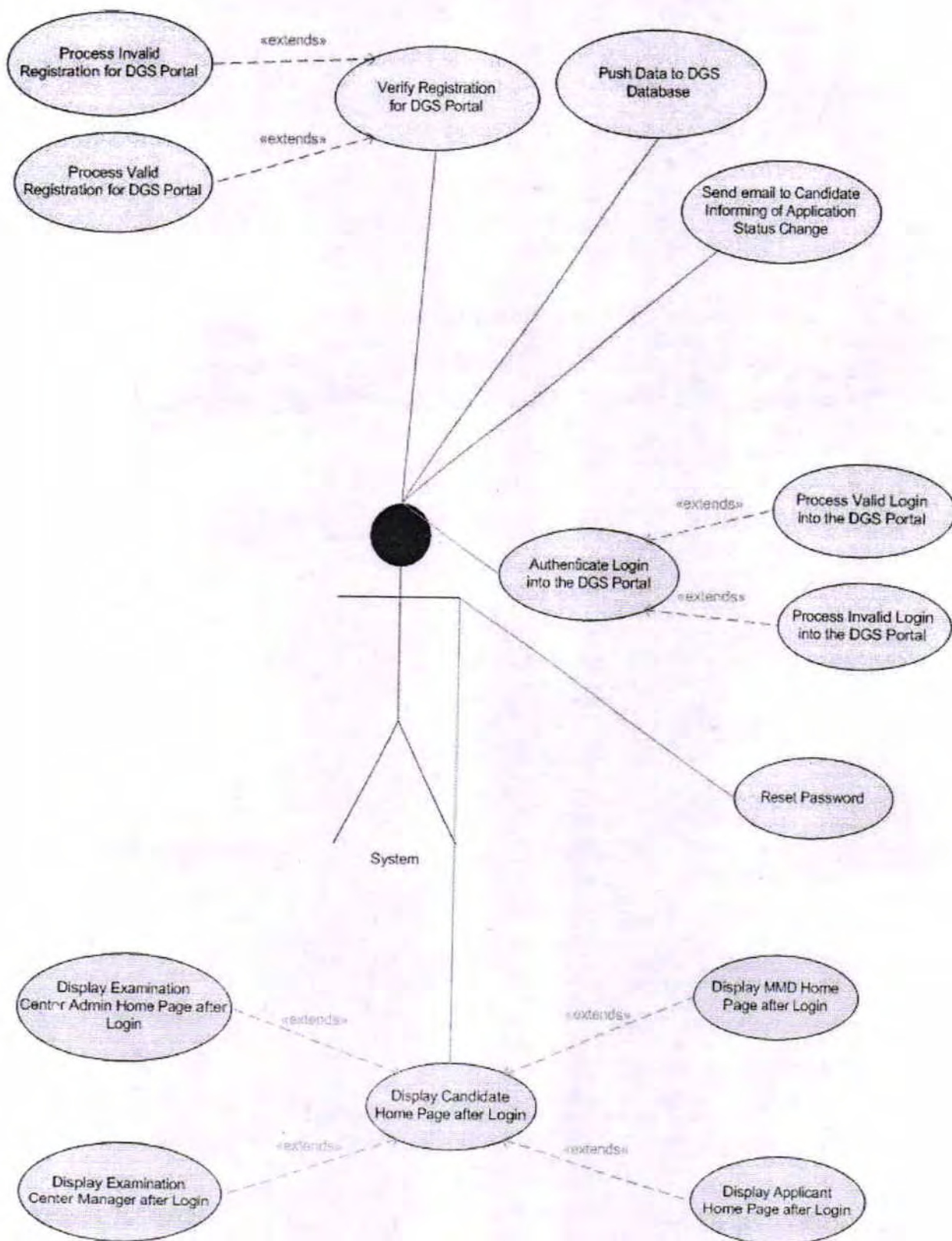


Fig. 3.5: Use Case Diagram for CREBS with Actor SYSTEM

3.2.2 Use Cases in CERS

The list of various cases identified in the process of object oriented analysis of the Candidate Examination Rendering Subsystem (CERS) is described in Table 3.2 below.

Use Case ID	Subsystem	Use Case	Actor(s)
UC.B.1	CERS	Log into Examination Application	Candidate, Examination Center Officer
UC.B.1.1	CERS	Log into Examination Application	Candidate
UC.B.1.2	CERS	Log into Examination Application	Examination Center Officer
UC.B.2	CERS	Authenticate Login into Examination Application	System
UC.B.2.1	CERS	Process Valid Login into Examination Application	System
UC.B.2.2	CERS	Process Invalid Login into Examination Application	System
UC.B.3	CERS	Display Examination Application Home Page	System
UC.B.3.1	CERS	Display Examination Application Home Page for Candidate	System
UC.B.3.2	CERS	Display Examination Application Home Page for Examination Center Officer	System
UC.B.4	CERS	Read Instructions	Candidate
UC.B.5	CERS	View Demo	Candidate
UC.B.6	CERS	Begin Examination	Candidate
UC.B.7	CERS	Display Examination Index Page	System
UC.B.8	CERS	View Specific Question	Candidate
UC.B.9	CERS	Display Specific Question	System
UC.B.9.1	CERS	Display Specific Question of Basic Question Type	System
UC.B.9.2	CERS	Display Specific Question of Special Question type	System
UC.B.10	CERS	Save Answer for Question	Candidate
UC.B.11	CERS	Go to Previous Question	Candidate

UC.B.12	CERS	Go to Next Question	Candidate
UC.B.13	CERS	Skip Question without Answering	Candidate
UC.B.14	CERS	Mark Question as Reviewed	Candidate
UC.B.15	CERS	View Problem Description for Special Question	Candidate
UC.B.16	CERS	View Specific Task Description for Special Question	Candidate
UC.B.17	CERS	Perform Task of Special Question	Candidate
UC.B.17.1	CERS	Save Solution for Specific Task of Special Question	Candidate
UC.B.18	CERS	Save and Close Special Question	Candidate
UC.B.19	CERS	Skip Special Question without Answering	Candidate
UC.B.20	CERS	Mark Special Question as Reviewed	Candidate
UC.B.21	CERS	Complete Examination and Submit Answers	Candidate
UC.B.22	CERS	Provide Time Remaining Alert	System
UC.B.23	CERS	Perform Time Run Out Process	System
UC.B.24	CERS	Perform End of Examination Process	System
UC.B.25	CERS	Perform Time Tracking for Examination	System
UC.B.26	CERS	Evaluate Candidate Examination Answers & Update Database	System
UC.B.26.1	CERS	Evaluate Candidate Solution for Special Question	System
UC.B.27	CERS	Push Examination Data of Specific Candidate to DGS Database	System
UC.B.28	CERS	View List of Candidates Currently Taking An Exam	Examination Center Officer
UC.B.29	CERS	View List of Candidates Scheduled for Current	Examination Center Officer

		Date	
UC.B.30	CERS	Perform Candidate Verification Checklist for Specific Candidate	Examination Center Officer
UC.B.31	CERS	Modify Candidate Booking for Rescheduling on Account of Extraordinary Circumstances	Examination Center Officer
UC.B.32	CERS	Provide Intervention on a Specific Examination of Candidate in Extraordinary Circumstances	Examination Center Officer
UC.B.33	CERS	Setup Resumed Examination for Specific Candidate on Rollback Option in Extraordinary Circumstances	Examination Center Officer
UC.B.34	CERS	Configure Time Remaining Alerts	Examination Center Officer
UC.B.35	CERS	Perform Backup of Database at Specific Examination Center	Examination Center Admin
UC.B.36	CERS	Perform Restore of Database at Specific Examination Center	Examination Center Admin
UC.B.37	CERS	Push Database Update to DGS	System
UC.B.38	CERS	Perform Sanity Check on Database at Specific Examination Center	System

Table 3.2: List of Use Cases in CERS

The use case descriptions for each one of the use cases as in Table 3.2 above in CREBS are given below.

UC.B.1: Log into Examination Application (Actors: Candidate, Examination Center Officer)

1. The actors login to the Examination Application.



UC.B.1.1: Log into Examination Application (Actor: Candidate)

1. Candidate accesses the Examination Application Login Page.
2. System displays Examination Application Login page with login section.
3. Candidate fills in his/her login credentials, selects the exam level and paper for which he/she is scheduled and the security key provided to candidate by the Examination Center Officer.
4. Candidate submits all the information.

UC.B.1.2: Log into Examination Application (Actor: Examination Center Officer)

1. Actor accesses the Exam Application Login Page.
2. System displays Examination Application Login page with login section.
3. Actor fills in his/her login credentials (user id, password and role) and submits.

UC.B.2: Authenticate Login into Examination Application (Actor: System)

This use case is triggered by UC.B.1.

1. In case of Examination Center Officer, system authenticates user id, password and role.
2. In case of Candidate, system authenticates the user id, password, exam level, exam paper and the security key as submitted by the Candidate.

UC.B.2.1: Process Valid Login into Examination Application (Actor: System)

This use case is triggered by UC.B.2.

Here, all the fields submitted by the Actor for login into the Examination Application are valid.

1. System logs the Actor into the Examination Application.

UC.B.2.2: Process Invalid Login into Examination Application (Actor: System)

This use case is triggered by UC.B.2.

Here, one of the fields submitted by the Actor is invalid.

1. System displays the login form, with the details filled and indicates that an error was encountered during login (e.g. Message: "Invalid userid").
2. Actor attempting login can resubmit the login form after correcting the fields.
3. System performs the authentication using the updated fields.

UC.B.3: Display Examination Application Home Page (Actors: Candidate, Examination Center Officer)

1. System displays relevant Examination Application Home Page for actor.

UC.B.3.1: Display Examination Application Home Page for Candidate (Actor: Candidate)

1. System displays Examination Application Home Page for Candidate.

The page will display the User name, Exam level and paper for which the examination is being conducted as well as the date and time. System also displays following menu of options: (a) Read Instructions (b) View Demo (c) Begin examination.

UC.B.3.2: Display Examination Application Home Page for Examination Center Officer (Actor: Examination Center Officer)

1. System displays Examination Application Home Page for Examination Center Officer.

The page will display following menu of options: (a) View List of Candidates Currently Taking An Exam (b) View List of Candidates Scheduled for Current Date (c) Configure Time Remaining Alerts.

UC.B.4: Read Instructions (Actor: Candidate)

1. Candidate selects the "Read Instructions" option
2. System displays the examination instructions for the candidate.

UC.B.5: View Demo (Actor: Candidate)

1. Candidate selects the "View Demo" option
2. System displays a demo of the Examination Application.

UC.B.6: Begin Examination (Actor: Candidate)

1. Candidate selects the "Begin Examination" option.
2. System displays a page that provides details of the examination. System displays message that as soon as candidate confirms that they wish to begin the examination, the examination clock will start. System provides an option for candidate to confirm that they wish to begin the examination.
3. Candidate confirms that they wish to begin the examination.
4. System generates a Candidate-specific question paper.
5. System starts the examination clock.
6. System displays the Examination Index Page.

UC.B.7: Display Examination Index Page (Actor: System)

This use case is triggered by UC.B.6.

1. System displays the examination index page. The examination index page displays all the questions for the examination. Each question will have an Answer status (Answered, Not Answered) as well as a Review status (Reviewed, Not Reviewed).
2. System displays a clock indicating the time that the examination has been running for.
3. System will provide candidate with the ability to select a specific question to view or answer.
4. System will also provide candidate with option "Complete Examination and Submit Answers".

UC.B.8: View Specific Question (Actor: Candidate)

1. Candidate selects a specific question to view.

UC.B.9: Display Specific Question (Actor: System)

1. System displays the specific question selected by Candidate. The question may be of two types: Basic Question type and Special Question type.

UC.B.9.1: Display Specific Question of Basic Question Type (Actor: System)

This use case is triggered by UC.B.9.

1. System displays the specific question of basic question type selected by Candidate. The display includes all the question details such as Question Id, Question description, Question Answer options, etc.
2. System provides candidate with ability to answer the question.
3. In a MCSS Question type, the ability to answer is likely to be provided through the use of radio buttons.
4. In a MCMS Question type, the ability to answer is likely to be provided through the use of check boxes.
5. In a Fill-in-the-blanks type, the ability to answer is likely to be provided through the use of a text box field.
6. System displays a clock indicating the time that the examination has been running for.
7. System also displays options for candidate to (a) Save answer for current question (b) Go to previous question (c) Go to next question (d) Skip the question without answering (e) Mark question as reviewed. Some of these options may be enabled /disabled as relevant. E.g. Save answer for current question will be enabled only if the candidate has filled up an answer. Go to previous question will be disabled for the first question in the examination. Go to next question will be disabled for the last question in the examination. Mark question as reviewed will be enabled only after a candidate has saved an answer for the specific question.
8. System also displays an option for candidate to go back to the Examination index page.

UC.B.9.2: Display Specific Question of Special Question type (Actor: System)

This use case is triggered by UC.B.9.

1. System displays the specific question selected by Candidate. The display includes the question details such as question Id, maximum marks for the question, a summary of the problem description, a list of tasks to be performed, etc.
2. System displays a clock indicating the time that the examination has been running for.
3. System also displays the following options for the Candidate: (a) Option to view the problem description (b) Options to view each task description (there could be more than one task) (c) Option to perform a specific task (d) Save and Close special question (e) Skip special question without answering (f) Mark special question as reviewed. Some of these options may be enabled /disabled as relevant. E.g. Save and Close special question will be enabled only if the candidate has performed a task. Mark question as reviewed will be enabled only after a candidate has saved a solution for special question.

4. System also displays an option for candidate to go back to the Examination index page.

UC.B.10: Save Answer for Question (Actor: Candidate)

1. Candidate answers the specific question of Basic Question type.
2. Candidate selects the "Save answer for current question" to indicate that he/she is done answering the specific question.
3. System saves the answer in the database for the specific question.

UC.B.11: Go to Previous Question (Actor: Candidate)

1. Candidate selects the "Go to previous question" option.
2. System displays the previous question.

UC.B.12: Go to Next Question (Actor: Candidate)

1. Candidate selects the "Go to next question" option.
2. System displays the next question.

UC.B.13: Skip Question without Answering (Actor: Candidate)

1. Candidate selects the "Skip Question without Answering" option.
2. System displays warning message informing candidate that the solution that they have entered for the question will not get saved if they select this option. System seeks a confirmation of action from the Candidate.
3. Candidate confirms action.
4. System deletes the candidate's solutions for the question.
5. System displays the next question in the examination.

UC.B.14: Mark Question as Reviewed (Actor: Candidate)

1. Candidate selects the "Mark Question as Reviewed" option.
2. System marks the Basic Question as reviewed.

UC.B.15: View Problem Description for Special Question (Actor: Candidate)

1. Candidate selects "View Problem Description" option for special question.
2. System displays the problem description for the special question.

UC.B.16: View Specific Task Description for Special Question (Actor: Candidate)

1. Candidate selects "View Specific Task Description" option for a specific task of the special question.
2. System displays the task description for the specific task of the special question.

UC.B.17: Perform Task of Special Question (Actor: Candidate)

1. Candidate selects "Perform Task" option for a specific task of the special question.
2. System displays the task performance area for the specific task.
3. Candidate performs the task using the tools provided in the task performance area.

UC.B.17.1: Save Solution for Specific Task of Special Question (Actor: Candidate)

1. Candidate selects "Save Solution for Specific Task" option.
2. System saves the solution for the task (based on the actions of the candidate in the task performance area) in the database.

UC.B.18: Save and Close Special Question (Actor: Candidate)

1. Candidate selects "Save and Close Special Question" option.
2. System saves the solutions for all the tasks of the Special Question in the database.
3. System displays the Examination Index Page.

UC.B.19: Skip Special Question without Answering (Actor: Candidate)

1. Candidate chooses "Skip Special Question without Answering".
2. System displays warning message informing candidate that the solutions that they have created for the tasks of the special question will not get saved if they select this option. System seeks a confirmation of action from the Candidate.
3. Candidate confirms action.



4. System deletes candidate's solutions for the tasks of the special question.
5. System displays the Examination Index Page.

UC.B.20: Mark Special Question as Reviewed (Actor: Candidate)

1. Candidate selects the "Mark Special Question as Reviewed" option.
2. System marks the special question as "Reviewed".

UC.B.21: Complete Examination and Submit Answers (Actor: Candidate)

1. Candidate chooses the "Complete Examination and Submit Answers".
2. System informs that if this action is taken, all answers will be submitted immediately and that the examination will be marked as completed.
3. System seeks confirmation from candidate on the action by providing the "Confirm Completion of Examination" and "Cancel Action" options.
4. If the Candidate selects the "Cancel Action" option, System will display the Examination Index page.
5. If the Candidate selects the "Confirm Completion of Examination" option, System initiates "End of Examination" process.

UC.B.22: Provide Time Remaining Alert (Actor: System)

1. System displays a warning message informing the candidate of the time remaining. (System may be able to provide multiple warning messages based on configuration by the Admin).

UC.B.23: Perform Time Run Out Process (Actor: System)

1. System performs time-run-out process when time runs out for Candidate.
2. System locks the computer in terms of preventing any further inputs from Candidate.
3. System displays message indicating that time has run out and that the examination process is over.
4. System initiates "End of Examination" process.

UC.B.24: Perform End of Examination Process (Actor: System)

1. System locks the computer and prevents any further input from the Candidate.

2. System displays message that end of examination has been confirmed by Candidate.
3. System updates database of Candidate's answers.
4. System invokes evaluation of Candidate's answers for exam.

UC.B.25: Perform Time Tracking for Examination (Actor: System)

1. System will track and record the total time that the examination has been running for.
2. System will also track and record the time that the user spends on each question.
3. System will update the time tracking information to the database at regular intervals (e.g. every minute) to support an examination roll back.

UC.B.26: Evaluate Candidate Examination Answers & Update Database (Actor: System)

1. System evaluates candidate examination answers.
2. System updates the candidate's results for each question on the database.

UC.B.26.1: Evaluate Candidate's Solution for Special Question (Actor: System)

This use case is triggered by UC.B.24.

1. System evaluates candidate solution submitted for Special Question.
2. System updates candidate's results for the Special Question on the database.

UC.B.27: Push Examination Data of Specific Candidate to DGS Database (Actor: System)

1. System pushes examination data of specific candidate to DGS Database using a secure transmission method.

UC.B.28: View List of Candidates Scheduled for Current Date (Actor: Examination Center Officer)

1. Actor chooses the "View List of Candidates Scheduled for Current Date" option.
2. System displays a list of candidates scheduled for an exam for current date at the specific Examination Center.



The list will display certain fields like Registration Id, Name, Email Id, BookingId, Booking Date and Time Slot and Start/End time of exam.

This page will also provide the Examination Center Officer with the following options: (a) View Booking for Specific Candidate Scheduled for Current Date (b) Perform Candidate Verification Checklist for Specific Candidate (c) Modify Candidate Booking for Rescheduling on Account of Extraordinary Circumstances.

UC.B.29: View List of Candidates Currently Taking An Exam (Actor: Examination Center Officer)

1. Actor chooses the "View List of Candidates Currently Taking An Exam" option.
2. System displays a list of candidates currently taking an exam for the specific Examination Center.

The list will display certain fields like Registration Id, Name, Email Id, BookingId, Booking Date and Time Slot, Start/End time of exam and Time elapsed.

This page will also provide the Examination Center Officer with the following options: (a) Provide Intervention on a Specific Examination of Candidate in Extraordinary Circumstances (b) Setup Resumed Examination for Specific Candidate on Rollback Option in Extraordinary Circumstances.

UC.B.30: Perform Candidate Verification (Actor: Examination Center Officer)

1. Candidate reports to Examination Center Officer.
2. Examination Center Officer performs a set of verification steps.
3. Examination Center Officer records results of the verification process in Verification Checklist.
4. System records the verification checklist.
5. System generates a security key for the candidate to use for the examination.
6. Examination Center Officer provides the security key to the candidate.

UC.B.31: Modify Candidate Booking for Rescheduling on Account of Extraordinary Circumstances (Actor: Examination Center Officer)

1. Examination Center Officer modifies Candidate booking and may reschedule booking during certain extraordinary circumstances. Several extraneous circumstances may prevent or

inhibit Candidate from taking the examination at scheduled slot. Some unforeseen circumstances are a Bandh, civic unrest, sudden illness, severe power outages in city, etc.

2. System records the changes and saves to database.

UC.B.32: Provide Intervention on a Specific Examination of Candidate in Extraordinary Circumstances (Actor: Examination Center Officer)

1. Examination Center Officer can intervene on a specific examination of Candidate in extraordinary circumstances. The need for intervention may arise from Candidate use of unfair means, local disturbances, etc. The types of intervention may be to stop Candidate from continuing with examination by locking his/her computer, saving data on exam so far, etc. Clearly, this option has to be used only in extraordinary circumstances and audit trail is maintained.
2. System records the changes and saves to database.

UC.B.33: Setup Resumed Examination for Specific Candidate on Rollback Option in Extraordinary Circumstances (Actor: Examination Center Officer)

1. It is possible that Candidate's examination may be interrupted owing to a variety of reasons. A hardware or software failure may prevent Candidate from continuing the examination. Extraordinary circumstances may necessitate intervention of examination by Examination Center Officer. Examination Center Officer performs setup operations to enable resumption of examination for specific candidate, rolling back to a valid previous state of the examination. Clearly, this option has to be used only in extraordinary circumstances and audit trail is maintained.

UC.B.34: Configure Time Remaining Alerts (Actor: Examination Center Officer)

1. Actor selects option to configure the "Time Remaining Alerts" for the candidates.
2. System displays a page where Actor can configure the alerts.
3. Actor configures the times at which alert should be provided (e.g. One hour remaining, 15 minutes remaining, 2 minutes remaining, etc.)
4. Actor submits configured alerts.
5. System saves alerts in the database.

The use case diagrams in UML for CERS are provided in three different use case diagrams for readability instead of in one single diagram.

***UC.B.35: Perform Backup of Database at Specific Examination Center
(Actor: Examination Center Admin)***

1. Actor chooses to Perform Backup of Database at Specific Examination Center.
2. System enables carrying out the backup function at the local database.

***UC.B.36: Perform Restore of Database at Specific Examination Center
(Actor: Examination Center Admin)***

1. Actor chooses to Perform Restore of Database at Specific Examination Center.
2. System enables carrying out the restore function at the local database.

UC.B.37: Push Database Update to DGS Database (Actor: System)

1. Database at a specific examination center will change from time to time based on examination related data that is collected at the specific examination center. System pushes database update from the examination center to the DGS database automatically whenever that update occurs.
2. System does integrity check on the local database after this.

UC.B.38: Perform Sanity Check on Candidates and Bookings Database at Specific Examination Center (Actor: System)

1. System performs sanity check on database at specific examination center periodically at specific times.
2. System alerts Examination Center Admin through online displays and emails those issues that require specific action.

The use case diagram for CERS with the relevant actor System is shown in Figure 3.6.

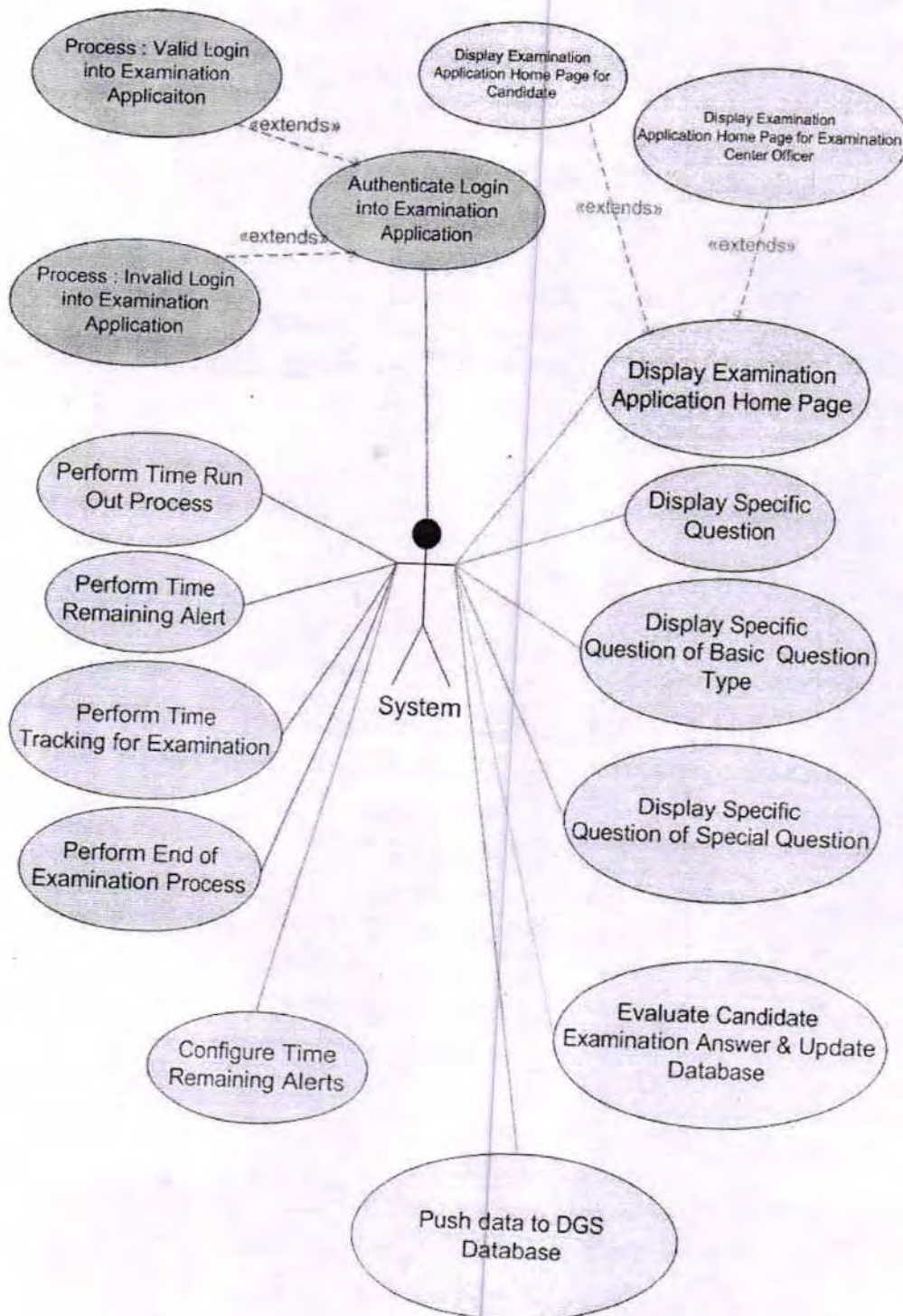


Fig. 3.6: Use Case Diagram of CERS with Actor SYSTEM

The use case diagram for CERS with the relevant actor Candidate is shown in Figure 3.7.

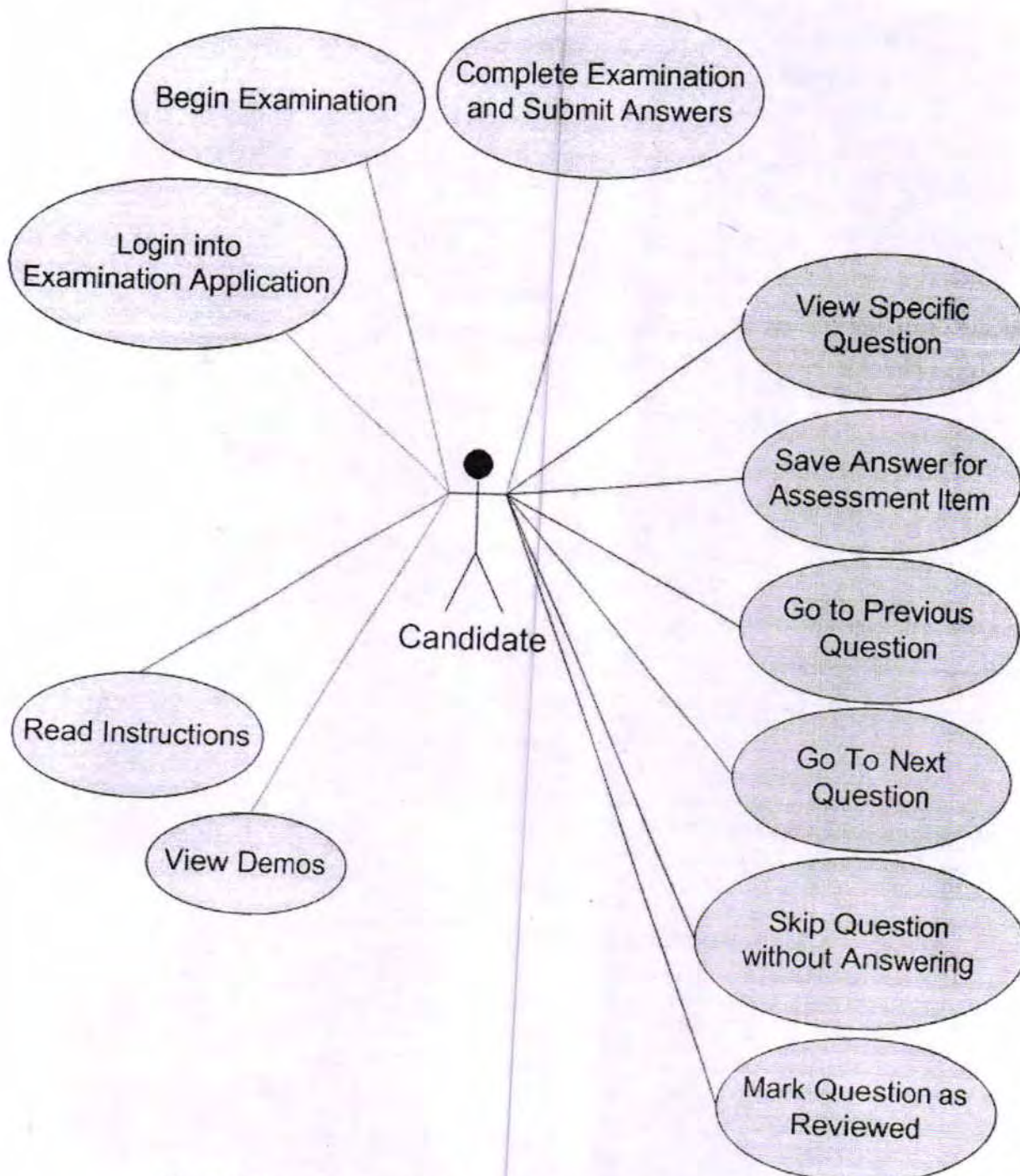


Fig. 3.7: Use Case Diagram of CERS with Actor CANDIDATE

The use case diagram for CERS with the relevant actor EXAMINATION CENTER OFFICER is shown in Figure 3.8.

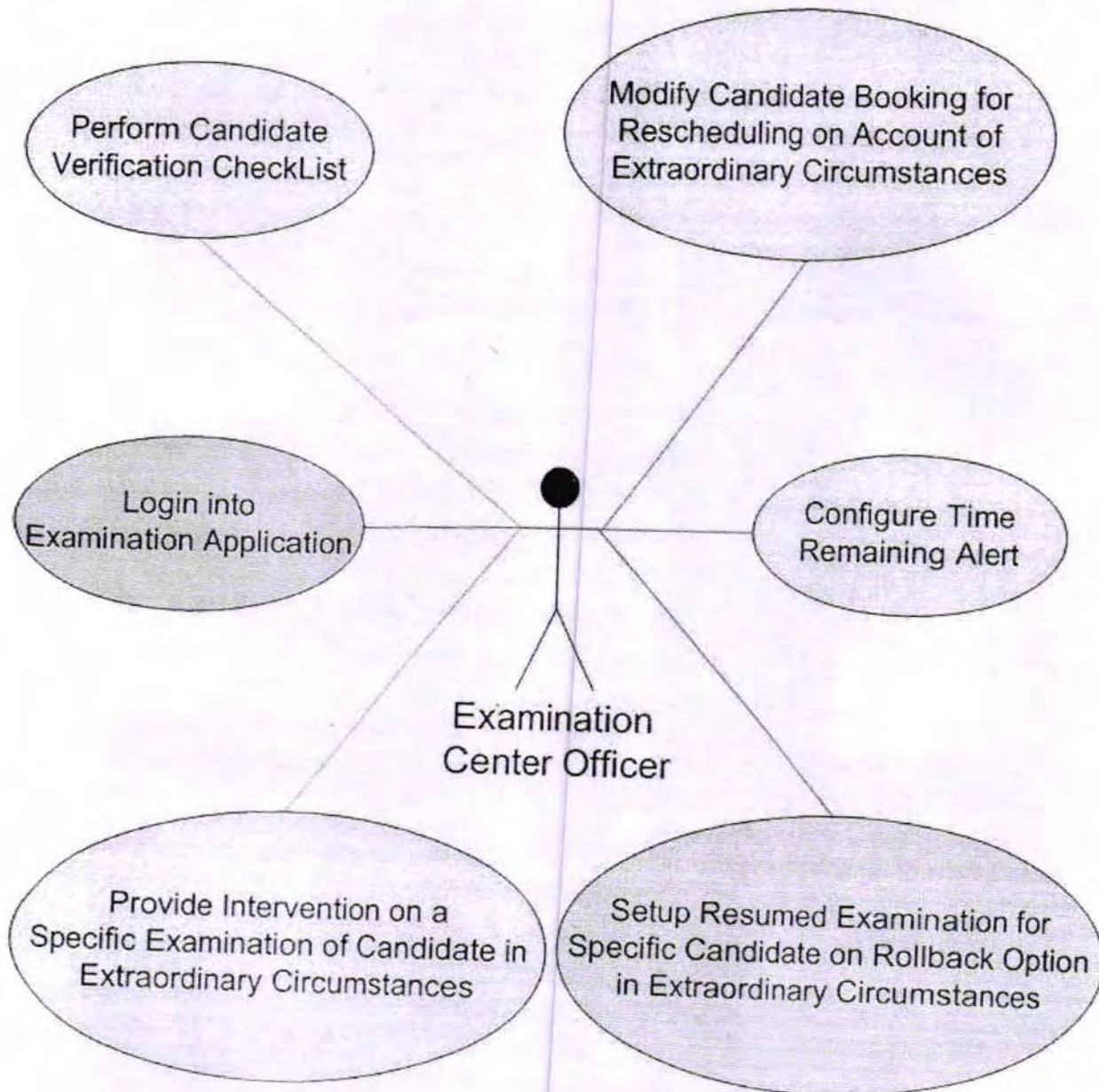
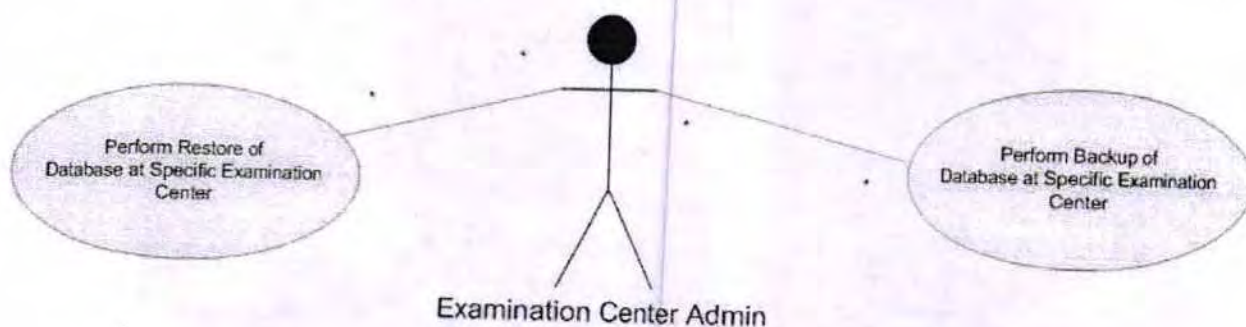


Fig. 3.8: Use Case Diagram of CERS with Actor EXAMINATION CENTER OFFICER

The use case diagram for CERS with the relevant actor EXAMINATION CENTER ADMIN is shown in Figure 3.9.



3.2.3 Use Cases in BQAS

The list of various cases identified in the process of object oriented analysis of the Basic Question Authoring Subsystem (BQAS) is described in Table 3.3 below.

Use Case ID	Subsystem	Use Case	Actor(s)
UC.C.1	BQAS	Log into the DGS Portal	Question Author; Question Reviewer; Chief Examiner; DGS Officer; DG
UC.C.2	BQAS	Authenticate login into the DGS portal	System
UC.C.2.1	BQAS	Process Valid Login into the DGS portal	System
UC.C.2.2	BQAS	Process Invalid Login into the DGS portal	System
UC.C.3	BQAS	Display BQAS Home Page after Login	System
UC.C.3.1	BQAS	Display BQAS Home Page after Login for Question Author	System
UC.C.3.2	BQAS	Display BQAS Home Page after Login for Question Reviewer	System
UC.C.3.3	BQAS	Display BQAS Home Page after Login for Chief Examiner, DGS Officer and DGS	System

UC.C.4	BQAS	Author New Basic Question	Question Author
UC.C.5	BQAS	Display Menu of Options of Basic Question Types for Authoring	System
UC.C.6	BQAS	Author Question of Type Multiple-Choice-Multiple-Answers	Question Author
UC.C.7	BQAS	Author Question of Type Multiple-Choice-Single - Answer	Question Author
UC.C.8	BQAS	Author Question of Type True-False	Question Author
UC.C.9	BQAS	Author Question of Type Matching-Lists	Question Author
UC.C.10	BQAS	View List of Basic Questions	Question Author, Question Reviewer, DGS Officer; Chief Examiner; DGS
UC.C.10.1	BQAS	View List of Basic Questions Filtered for Specific Options	Question Author, Question Reviewer, DGS Officer; Chief Examiner; DGS
UC.C.10.2	BQAS	View List of Basic Questions in Sorted Order	Question Author, Question Reviewer, DGS Officer; Chief Examiner; DGS
UC.C.11	BQAS	View Specific Basic Question	Question Author
UC.C.12	BQAS	Edit Specific Basic Question	Question Author
UC.C.13	BQAS	Mark Specific Basic Question for Deletion	Question Author
UC.C.14	BQAS	View List of Basic Questions Marked for Review	Question Reviewer
UC.C.15	BQAS	View Specific Basic Question Marked for Review	Question Reviewer

UC.C.16	BQAS	Approve Basic Question	Question Reviewer
UC.C.17	BQAS	Reject Basic Question	Question Reviewer
UC.C.18	BQAS	Modify and Approve Basic Question	Question Reviewer
UC.C.19	BQAS	Request Clarifications on Basic Question from Question Author	Question Reviewer
UC.C.20	BQAS	View List of Basic Questions Post-Review	Question Author
UC.C.21	BQAS	View Specific Basic Question Post-Review	Question Author
UC.C.22	BQAS	Provide Clarifications on Basic Question Post-Review	Question Author
UC.C.23	BQAS	Retire Specific Basic Question	DGS Officer; Chief Examiner; DGS
UC.C.24	BQAS	View List of Regular Reports on Basic Questions	DGS Officer; Chief Examiner; DGS
UC.C.24.1	BQAS	View Specific Report on Basic Questions	DGS Officer; Chief Examiner; DGS
UC.C.24.2	BQAS	Print Specific Report on Basic Questions	DGS Officer; Chief Examiner; DGS

Table 3.3: List of Use Cases in BQAS

The use case descriptions for each one of the use cases as in Table 3.3 above in BQAS are given below.

UC.C.1: Log in Using Login Credentials (Actor: Question Author, Question Reviewer, Chief Examiner, DGS Officer, DGS)

1. Actor accesses DGS web portal.
2. System displays portal login page.
3. Actor fills his/her credentials (userid, password and role) and submits.

UC.C.2: Authenticate Login into the DGS portal (Actor: System)

This use case is triggered by UC.C.1.

1. System authenticates the userid, password and role as submitted by the Actor.

UC.C.2.1: Process Valid Login into the DGS portal (Actor: System)

This use case is triggered by UC.C.2 (Authenticate Login into the DGS portal).

Here, all the fields submitted by the Actor for login into the DGS portal are valid.

1. System logs the Actor into the system
2. System displays Actor's home page. Each Actor will have a personalized home page providing a menu of relevant options based on role of Actor.

UC.C.2.2: Process Invalid Login into the DGS portal (Actor: System)

This use case is triggered by UC.C.2 (Authenticate Login into the DGS portal).

Here, either the userid or password submitted for login into the DGS portal is invalid.

1. System displays the login form, with the userid filled and indicates that an error was encountered during login (Message: "Invalid userid or password").
2. Actor attempting login can resubmit the login form after correcting the fields.
3. System performs the authentication using the updated fields.

UC.C.3: Display BQAS Home Page after Login (Actor: System)

1. System displays BQAS Home page after Login with a menu of options based on user who has logged in.

UC.C.3.1: Display BQAS Home Page after Login for Question Author (Actor: System)

1. System displays BQAS Home page after Login with a menu of options for Question Author for authoring Basic Questions. The page contains the following menu of options (a) Author New Basic Question (b) View List of Basic Questions (c) View Specific Basic Question (d) Edit



Specific Basic Question (e) Mark Specific Basic Question for Deletion (f) View List of Basic Questions Post-Review (g) Provide Clarifications on Specific Basic Question On Query from Question Reviewer (h) Author New Special Question (i) View List of Special Questions (j) View Specific Special Question (k) Edit Specific Special Question (l) Mark Specific Special Question for Deletion (m) View List of Special Questions Post-Review (n) Provide Clarifications on Specific Special Question On Query from Question Reviewer

***UC.C.3.2: Display BQAS Home Page after Login for Question Reviewer
(Actor: System)***

1. System displays BQAS Home page after Login with a menu of options for Question Reviewer. The page contains the following menu of options (a) View List of Basic Questions Marked for Review (b) View List of Special Questions Marked for Review (c) View Specific Basic Question Marked for Review (d) View Specific Special Question Marked for Review (e) Review Specific Basic Question (f) Review Specific Special Question

UC.C.3.3: Display BQAS Home Page after Login for Chief Examiner; DGS Officer; DG (Actor: System)

1. System displays the following menu of options (a) View List of Reports on Basic Questions (b) View List of Reports on Special Questions (c) View List of Basic Questions (d) View List of Special Questions (e) View Specific Basic Question (f) View Specific Special Question (g) Retire Specific Basic Question (h) Retire Specific Special Question

UC.C.4: Author New Basic Question (Actor: Question Author)

1. Question Author chooses the "Author New Question" option from the menu of options.

***UC.C.5: Display Menu of Options of Basic Question Types for Authoring
(Actor: System)***

1. System displays a menu of options of Basic Question types for authoring. The options are (a) Multiple Choice Multiple Answers (b) Multiple Choice Single Answer (c) True-False (d) Matching Lists.

UC.C.6: Author Question of Type Multiple-Choice-Multiple-Answer (Actor: Question Author)

This use case is triggered by UC.C.5 (Display Menu of Options of Basic Question Types for Authoring).

1. Question Author chooses the Question type as Multiple-choice-Multiple-Answers. This question type enables the author to create question with four /five possible answer options, with one or more options being correct.
2. System displays form for entering the details of the question.
3. Author fills in the details of the question. The form can support rich text data. Author fills in the problem description, the task description, four/five possible answers options. Author also indicates the right answer options (There would be a facility to mark one or more answer options as part of the correct answer).
4. Author also provides information on the Basic Questions such as (a) Paper/Function (b) Topic (c) Grade (MEO Class IV here) (d) List of Competencies this question is concerned with assessing (e) Level of difficulty as low/medium/high (f) Notional time required to answer this question in minutes.
5. Author chooses to save question.
6. System performs validation on question authored and saves it.
7. System flags the question as "To Be Reviewed" and informs the Question Reviewer.

UC.C.7: Author Question of Type Multiple-Choice-Single-Answer (Actor: Question Author)

This use case is triggered by UC.C.5 (Display Menu of Options of Basic Question Types for Authoring).

1. Question Author chooses the question type as Multiple-choice-Single-Answer. This question type enables the author to create question with four /five possible answer options, with only one of the options being correct.
2. System displays form for entering the details of the question.
3. Author fills in the details of the question. The form can support rich text data. Author fills in the problem description, the task description, four/five possible answers options. Author also indicates the right answer option (There would be a facility to mark only one option as the correct answer).
4. Author also provides information on the basic questions such as (a) Paper/Function (b) Topic (c) Grade (MEO Class IV here) (d) List of Competencies this question is concerned with



assessing (e) Level of difficulty as low/medium/high (f) Notional time required to answer this question in minutes.

5. Author chooses to save question.
6. System performs validation on question authored and saves it.
7. System flags the question as "To Be Reviewed" and informs the Question Reviewer.

UC.C.8: Author Question of Type True-False (Actor: Question Author)

This use case is triggered by UC.C.5 (Display Menu of Options of Basic Question Types for Authoring).

1. Question Author chooses the question type as True-False. This question type enables the author to create question with possible answer options as only True or False, with only one of the options being correct.
2. System displays form for entering the details of the question.
3. Author fills in the details of the question. The form can support rich text data. Author fills in the problem description and the task description, Author indicates the right answer option (There would be a facility to mark only one of the two options – True or False - as the correct answer).
4. Author also provides information on the basic questions such as (a) Paper/Function (b) Topic (c) Grade (MEO Class IV here) (d) List of Competencies this question is concerned with assessing (e) Level of difficulty as low/medium/high (f) Notional time required to answer this question in minutes.
5. Author chooses to save question.
6. System performs validation on question authored and saves it.
7. System flags the question as "To Be Reviewed" and informs the Question Reviewer.

UC.C.9: Author Question of Type Matching Lists (Actor: Question Author)

This use case is triggered by UC.C.5 (Display Menu of Options of Basic Question Types for Authoring).

1. Question Author chooses the Question type as Matching Lists. This question type enables the author to create question with two lists, with items from first list matched uniquely with items from the second list.
2. System displays form for entering the details of the question.

3. Author fills in the details of the question. The form can support rich text data. Author fills in the problem description, the task description and the items of the two lists (in matched order).
4. Author also provides information on the basic questions such as (a) Paper/Function (b) Topic (c) Grade (MEO Class IV here) (d) List of Competencies this question is concerned with assessing (e) Level of difficulty as low/medium/high (f) Notional time required to answer this question in minutes.
5. Author chooses to save question.
6. System performs validation on question authored and saves it.
7. System flags the question as "To Be Reviewed" and informs the Question Reviewer.

UC.C.10: View List of Basic Questions (Actor: Question Author, Question Reviewer, Chief Examiner, DGS Officer, DG)

1. Actor chooses to view list of Basic Questions.
2. System displays list of questions. System will only display those questions that the Actor has permission for:
 - a. Question Author: System will display items that the Question Author has authored.
 - b. Question Reviewer: System will display items for papers that the Question Reviewer is in charge of.
 - c. Chief Examiner, DGS Officer, DG: System will display all questions for all papers.

UC.C.10.1: View List of Basic Questions Filtered for Specific Options (Actor: Question Author)

This use case is triggered by UC.C.10 (View List of Basic Questions).

1. Actor chooses to filter list based on (a) Question type (b) Paper (c) Topic (d) Level of Difficulty (e) Question Id (f) Date of Creation
2. System displays list with only questions matching selected filter.

UC.C.10.2: View List of Basic Questions in Sorted Order (Actor: Question Author)

This use case is triggered by UC.C.10 (View List of Basic Questions).



1. Actor chooses to sort list based on (a) Question type (b) Paper (c) Topic (d) Level of Difficulty (e) Question Id (f) Date of Creation
2. System will display the list of items in selected sorted order.

UC.C.11: View Specific Basic Question (Actor: Question Author)

1. Author selects "View a Specific Basic Question" option.
2. System displays the specific Basic Question in a non-editable mode.

UC.C.12: Edit Specific Basic Question (Actor: Question Author)

1. Author selects "Edit a Specific Basic Question" option.
2. System displays the specific basic question in an editable mode.
3. Author makes changes to the question and submits.
4. System saves the changes for the question.
5. System flags the question as "To Be Reviewed" and informs the Question Reviewer. Until such time, action is completed by Question Reviewer, the previously saved basic question would remain active in the database.

UC.C.13: Mark Specific Basic Question for Deletion (Actor: Question Author)

1. Author selects "Mark Specific Basic Question for Deletion" option.
2. System displays the specific basic question in a non-editable mode and seeks confirmation that Actor wants to delete the item.
3. Actor confirms that he/she wants to mark the item for deletion.
4. System changes the status of question to inactive.
5. System flags the question as "To Be Deleted" and informs the Question Reviewer. Until such time as the action is completed by Question Reviewer, the previously saved basic question would remain inactive in the database and will not be used for tests.

UC.C.14: View List of Basic Questions Marked for Review (Actor: System)

1. Actor chooses to view list of Basic Questions.
2. System displays list of Basic Questions marked for review and to be reviewed by Question Reviewer.

UC.C.15: View Specific Basic Question Marked for Review (Actor: Question Reviewer)

This use case is triggered by UC.C.14 (View List of Basic Questions Marked for Review).

1. Question Reviewer chooses a specific Basic Question marked for review from the list.
2. System displays selected Basic Question.
3. System also displays following menu of options (a) Approve Basic Question As-Is (b) Reject Basic Question Reviewed (c) Modify and Approve Basic Question (d) Request Clarifications from Question Author on Selected Basic Question.

UC.C.16: Approve Selected Basic Question As-Is (Actor: Question Reviewer)

1. Question Reviewer selects "Approve Basic Question As-Is" option.
2. System commits Basic Question to production database. A decision can be made whether to inform the author of this action.

UC.C.17: Reject Basic Question (Actor: Question Reviewer)

1. Question Reviewer selects "Reject Basic Question" option and provides reason(s) for rejecting it.
2. The Question is marked as rejected and is not committed to the production database.
3. System sends message to Question Author about the rejection along with the reasons for the action. Author is not expected to perform any further action on this through the system. Author is however free to create a fresh Basic Question again after considering the reasons for the rejection.

UC.C.18: Modify and Approve Basic Question (Actor: Question Reviewer)

1. Question Reviewer selects "Modify and Approve Basic Question" option.
2. System displays the Basic Question in an editable mode.
3. Question Reviewer modifies the Basic Question and saves it.
4. System saves the changes for the Basic Question.
5. System commits this question into the database.



UC.C.19: Request Clarifications from Question Author on Basic Question (Actor: Question Reviewer)

1. Question Reviewer selects "Request Clarifications from Question Author on Basic Question" option.
2. System displays a form where Question Reviewer fills in the query he/she has and submits.
3. System saves the request and sends the request message to Question Author.

UC.C.20: View List of Basic Questions Post-Review (Actor: Question Author)

1. Question Author selects "View List of Basic Questions Post-Review" option.
2. System displays list of Basic Questions post-review with status of each item.
3. System also provides the Question Author with the following menu of options (a) View Specific Question from List of Questions Post-Review for Action (b) Provide Clarifications on Basic Question Post-Review.

UC.C.21: View Specific Basic Question Post-Review (Actor: Question Author)

1. Question Author selects "View Specific Basic Question Post-Review"
2. System displays selected Basic Question along with review details.

UC.C.22: Provide Clarifications on Basic Question Post-Review (Question Author)

1. Question Author selects "Provide clarifications on Basic Question Post-Review".
2. System displays a form where Question Author replies to the query from the Question Author and submits.
3. System saves the response and sends the response message to Question Reviewer.

UC.C.23: Retire Specific Basic Question (Actor: Chief Examiner, DGS Officer, DGS)

1. Actor selects "Retire Specific Basic Question" option
2. System displays selected Basic Question and requests for confirmation and reasons.
3. Actor provides reasons for retiring and confirms action.

4. System marks the selected Basic Question as retired along with reasons given by Actor for retiring it. A retired Basic Question would continue to remain in the database, but will not be available for using in any assessment examination.

UC.C.24: View List of Reports on Basic Questions (Actor: Chief Examiner, DGS Officer, DGS)

1. Actor chooses "View List of Reports" option. The list of reports would be articulated after discussions during the meeting at DGS on 2nd August 2010.
2. System displays a list of reports available. System provides an ability by which Actor can select a specific report for viewing or printing.

UC.C.24.1: View Specific Report on Basic Questions Criteria (Actor: Chief Examiner, DGS Officer, DGS)

This use case is triggered by UC.C.24 (View List of Reports on Basic Questions).

1. Actor chooses to view specific report on Basic Questions.
2. System creates report and displays for viewing.

UC.C.24.2: Print Specific Report on Basic Questions Criteria (Actor: Chief Examiner, DGS Officer, DGS)

This use case is triggered by UC.C.24 or UC.C.24.1.

1. Actor chooses to print specific report on Basic Questions.
2. System creates report in printer friendly format and prints the report.

The use case diagrams in UML for BQAS are provided in three different use case diagrams for readability instead of in one single diagram.

The use case diagram of BQAS with actor Question Author is shown in Figure 3.10.

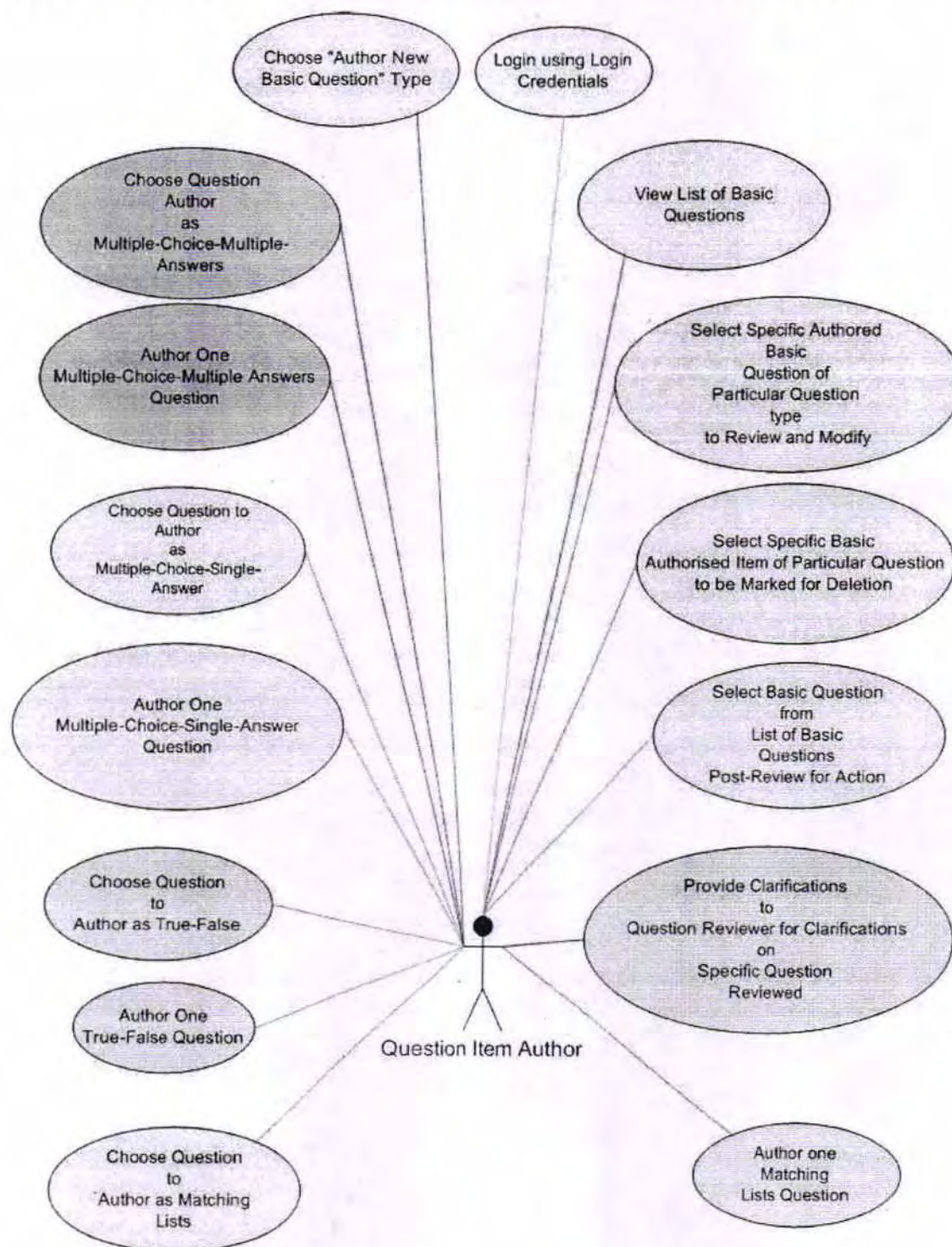


Fig.3.10: Use Case Diagram of with Actor QUESTION AUTHOR

The use case diagram of BQAS with the actor System is displayed in Figure 3.11.

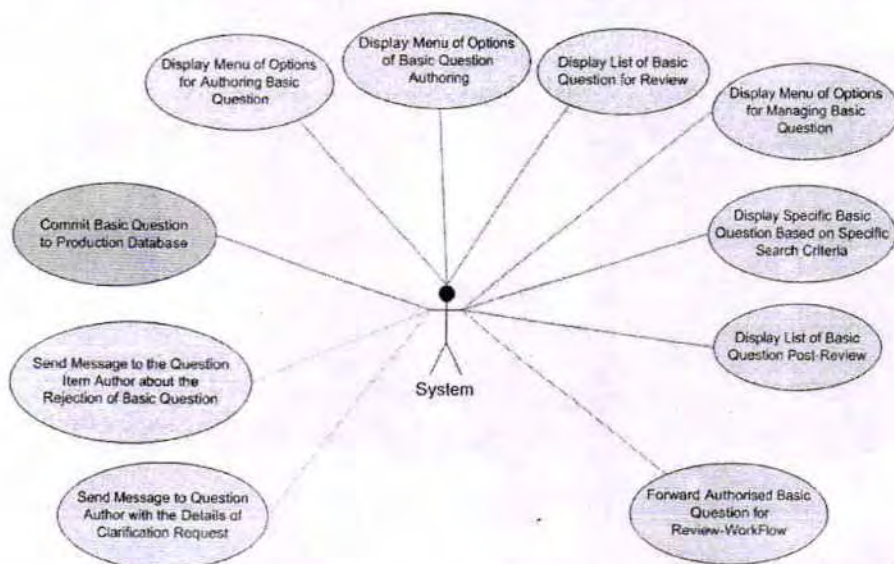


Fig. 3.11: Use Case Diagram of BQAS with Actor SYSTEM

The use case diagram of BQAS with actors Question Reviewer, DGS, DGS Officer and Chief Examiner is shown in Figure 3.12.

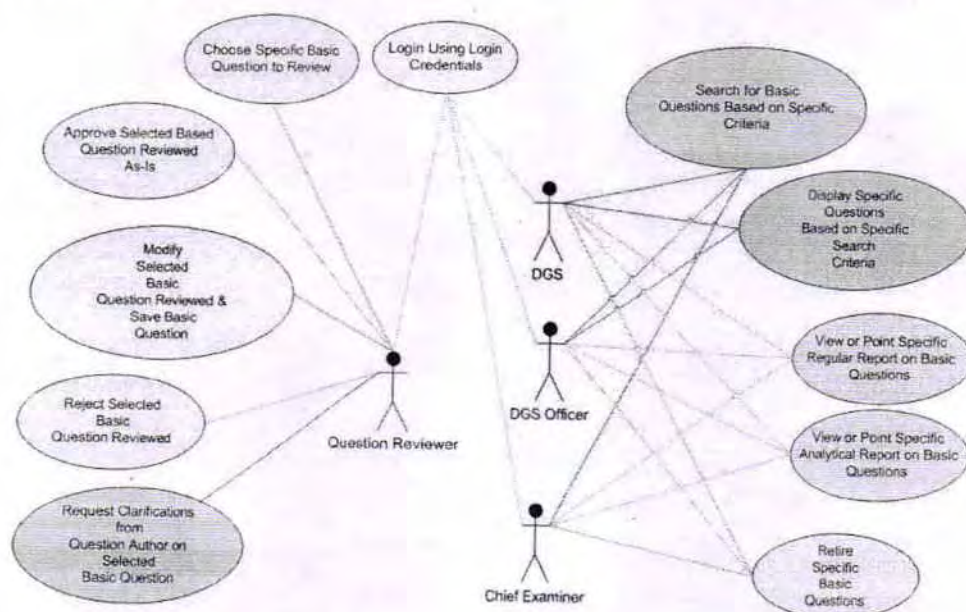


Fig.3.12: Use Case Diagram with Actors QUESTION REVIEWER, DGS, DGS OFFICER, & CHIEF EXAMINER

3.2.4 Use Cases in SQAS

The list of various cases identified in the process of object oriented analysis of the Special Assessment Authoring Subsystem (SQAS) is described in Table 3.4 below.

Use Case ID	Subsystem	Use Case	Actor(s)
UC.D.1	SQAS	Author New Special Question	Question Author
UC.D.2	SQAS	Display Menu of Options of Special Question types for Authoring	System
UC.D.3	SQAS	Author Question of Specific Special Question type	Question Author
UC.D.4	SQAS	View List of Special Questions	Question Author, Question Reviewer, DGS Officer; Chief Examiner; DGS
UC.D.4.1	SQAS	View List of Special Questions Filtered for Specific Options	Question Author, Question Reviewer, DGS Officer; Chief Examiner; DGS
UC.D.4.2	SQAS	View List of Special Questions in Sorted Order	Question Author, Question Reviewer, DGS Officer; Chief Examiner; DGS
UC.D.5	SQAS	View Specific Special Question	Question Author
UC.D.6	SQAS	Edit Specific Special Question	Question Author
UC.D.7	SQAS	Mark Specific Special Question for Deletion	Question Author
UC.D.8	SQAS	View List of Special Questions Marked for Review	Question Reviewer
UC.D.9	SQAS	View Specific Special Question Marked for Review	Question Reviewer

UC.D.10	SQAS	Approve Special Question	Question Reviewer
UC.D.11	SQAS	Reject Special Question	Question Reviewer
UC.D.12	SQAS	Modify and Approve Special Question	Question Reviewer
UC.D.13	SQAS	Request Clarifications on Special Question from Question Author	Question Reviewer
UC.D.14	SQAS	View List of Special Questions Post-Review	Question Author
UC.D.15	SQAS	View Specific Special Question Post-Review	Question Author
UC.D.16	SQAS	Provide Clarifications on Special Question Post-Review	Question Author
UC.D.17	SQAS	Retire Specific Special Question	DGS Officer; Chief Examiner; DGS
UC.D.18	SQAS	View List of Reports on Special Questions	DGS Officer; Chief Examiner; DGS
UC.D.18.1	SQAS	View Specific Report on Special Questions	DGS Officer; Chief Examiner; DGS
UC.D.18.2	SQAS	Print Specific Report on Special Questions	DGS Officer; Chief Examiner; DGS

Table 3.4: List of Use Cases in SQAS

The use case descriptions for each one of the use cases as in Table 3.4 above in SQAS are given below.

UC.D.1: Author New Special Question (Actor: Question Author)

1. Question Author chooses the "Author New Question" option from the menu of options.

UC.D.2: Display Menu of Options of Special Question Types for Authoring (Actor: System)



1. System displays a menu of options of special question types for authoring. The final set of special question types will be decided after discussions with DGS.

UC.D.3: Author Question of Specific Special Question type (Actor: Question Author)

1. Question Author chooses to author an question of specific special question type.
2. System displays the specification area for entering the details of the question.
3. Author fills in the details of the question. The details include (a) Problem Description template (b) Task Description template (c) Paper/Function (d) Topic (e) Grade (MEO Class IV here) (f) List of Competencies this question is concerned with assessing (g) Level of difficulty as low/medium/high (h) Notional time required to perform the tasks in minutes (i) Evaluation scheme.
 - a. The system will have the ability to automatically generate the specific problem description and task description for the question. The author only enters the template for the problem description and task description.
4. Author enters the solution for each task. The software module required to provide a solution for each special question will be specific to each special question type. The specification for these modules will be developed after definition of the final set of special question types.
5. Author enters the evaluation scheme for the question.
6. Author chooses to save the question.
7. System performs validation on question authored and saves it.
8. System flags the question as "To Be Reviewed" and informs the Question Reviewer.

UC.D.4: View List of Special Questions (Actor: Question Author, Question Reviewer, Chief Examiner, DGS Officer, DGS)

1. Actor chooses to view list of Special Questions.
2. System displays list of questions. System will only display those questions that the Actor has permission for:
 - a. Question Author: System will display items that the Question Author has authored.
 - b. Question Reviewer: System will display items for papers that the Question Reviewer is in charge of.
 - c. Chief Examiner, DGS Officer, DGS: System will display all questions for all papers.

UC.D.4.1: View List of Special Questions Filtered for Specific Options (Actor: Question Author)

This use case is triggered by UC.D.4 (View List of Special Questions).

1. Actor chooses to filter list based on (a) Question type (b) Paper (c) Topic (d) Level of Difficulty (e) Question Id (f) Date of Creation
2. System displays list with only Special Questions matching selected filter.

UC.D.4.2: View List of Special Questions in Sorted Order (Actor: Question Author)

This use case is triggered by UC.D.4 (View List of Special Questions).

1. Actor chooses to sort list based on (a) Question type (b) Paper (c) Topic (d) Level of Difficulty (e) Question Id (f) Date of Creation
2. System will display the list of items in selected sorted order.

UC.D.5: View Specific Special question (Actor: Question Author)

1. Author selects "View a Specific Special Question" option.
2. System displays the specific special question in a non-editable mode.

UC.D.6: Edit Specific Special Question (Actor: Question Author)

1. Author selects "Edit a Specific Special question" option.
2. System displays the specific special question in an editable mode.
3. Author makes changes to the question and submits.
4. System saves the changes for the question.
5. System flags the question as "To Be Reviewed" and informs the Question Reviewer. Until such time, action is completed by Question Reviewer, the previously saved special question would remain active in the database.

UC.D.7: Mark Specific Special Question for Deletion (Actor: Question Author)

1. Author selects "Mark Specific Special question for Deletion" option.



2. System displays the specific special question in a non-editable mode and seeks confirmation that Actor wants to delete the item.
3. Actor confirms that he/she wants to mark the item for deletion.
4. System changes the status of question to inactive.
5. System flags the question as "To Be Deleted" and informs the Question Reviewer. Until such time as the action is completed by Question Reviewer, the previously saved special question would remain inactive in the database and will not be used for tests.

UC.D.8: View List of Special Questions Marked for Review (Actor: System)

1. Actor chooses to view list of Special Questions.
2. System displays list of Special Questions marked for review and to be reviewed by Question Reviewer.

UC.D.9: View Specific Special Question Marked for Review (Actor: Question Reviewer)

This use case is triggered by UC.D.8 (View List of Special Questions Marked for Review).

1. Question Reviewer chooses a specific special question marked for review from the list.
2. System displays selected special question.
3. System also displays following menu of options (a) Approve Special question As-Is (b) Reject Special question Reviewed (c) Modify and Approve Special question (d) Request Clarifications from Question Author on Selected Special question.

UC.D.10: Approve Selected Special Question As-Is (Actor: Question Reviewer)

1. Question Reviewer selects "Approve Special Question As-Is" option.
2. System commits special question to production database. A decision can be made whether to inform the author of this action.

UC.D.11: Reject Special Question (Actor: Question Reviewer)

1. Question Reviewer selects "Reject Special question" option and provides reason(s) for rejecting it.
2. The Question is marked as rejected and is not committed to the production database.

3. System sends message to Question Author about the rejection along with the reasons for the action. Author is not expected to perform any further action on this through the system. Author is however free to create a fresh special question again after considering the reasons for the rejection.

UC.D.12: Modify and Approve Special Question (Actor: Question Reviewer)

1. Question Reviewer selects "Modify and Approve Special Question" option.
2. System displays the Special Question in an editable mode.
3. Question Reviewer modifies the special question and saves it.
4. System saves the changes for the special question.
5. System commits this question into the database.

UC.D.13: Request Clarifications from Question Author on Special Question (Actor: Question Reviewer)

1. Question Reviewer selects "Request Clarifications from Question Author on Special question" option.
2. System displays a form where Question Reviewer fills in the query he/she has and submits.
3. System saves the request and sends the request message to Question Author.

UC.D.14: View List of Special Questions Post-Review (Actor: Question Author)

1. Question Author selects "View List of Special Questions Post-Review" option.
2. System displays list of Special Questions post-review with status of each item.
3. System also provides the Question Author with the following menu of options (a) View Specific Question from List of Questions Post-Review for Action (b) Provide Clarifications on Special Question Post-Review.

UC.D.15: View Specific Special Question Post-Review (Actor: Question Author)

1. Question Author selects "View Specific Special question Post-Review"
2. System displays selected special question along with review details.



UC.D.16: Provide Clarifications on Special Question Post-Review (Question Author)

1. Question Author selects "Provide clarifications on Special Question Post-Review".
2. System displays a form where Question Author replies to the query from the Question Author and submits.
3. System saves the response and sends the response message to Question Reviewer.

UC.D.17: Retire Specific Special Question (Actor: Chief Examiner, DGS Officer, DGS)

1. Actor selects "Retire Specific Special Question" option
2. System displays selected Special Question and requests for confirmation and reasons.
3. Actor provides reasons for retiring and confirms action.
4. System marks the selected special question as retired along with reasons given by Actor for retiring it. A retired special question would continue to remain in the database, but will not be available for using in any assessment examination.

UC.D.18: View List of Reports on Special Questions (Actor: Chief Examiner, DGS Officer, DGS)

1. Actor chooses "View List of Reports" option. The list of reports would be articulated after discussions during the meeting at DGS on 2nd August 2010.
2. System displays a list of reports available. System provides an ability by which Actor can select a specific report for viewing or printing.

UC.D.18.1: View Specific Report on Special Questions Criteria (Actor: Chief Examiner, DGS Officer, DGS)

This use case is triggered by UC.D.18 (View List of Reports on Special Questions).

1. Actor chooses to view specific report on Special Questions.
2. System creates report and displays for viewing.

UC.D.18.2: Print Specific Report on Special Questions Criteria (Actor: Chief Examiner, DGS Officer, DGS)

This use case is triggered by UC.D.18 or UC.D.18.1.

1. Actor chooses to print specific report on Special Questions.
2. System creates report in printer friendly format and prints the report.

The use case diagrams in UML for SQAS are provided in three different use case diagrams for readability instead of in one single diagram.

The use case diagram of SQAS with actors System and Question Author is given in Figure 3.13.

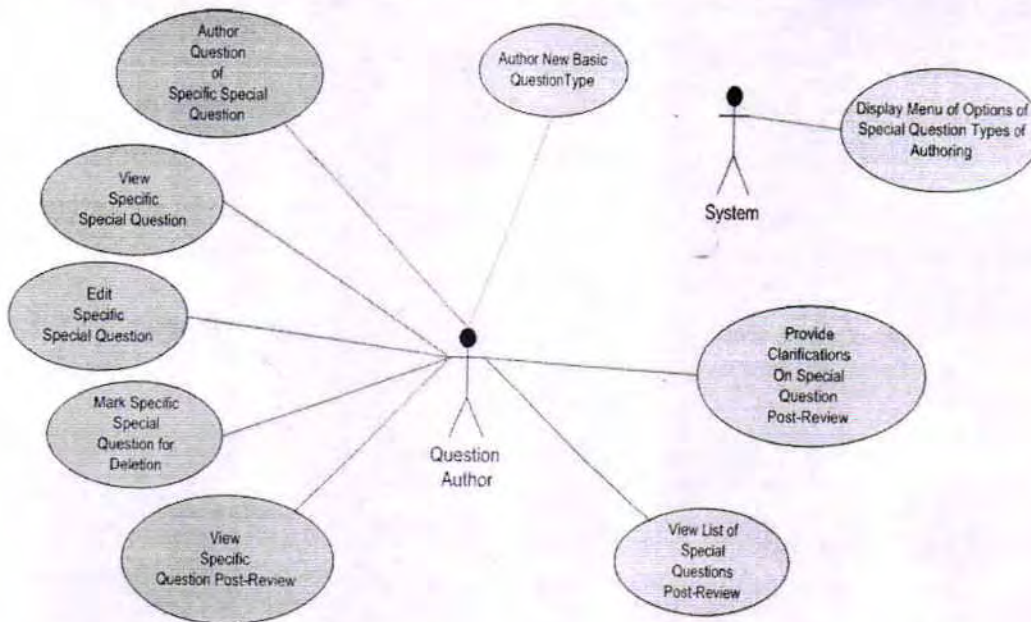


Fig. 3.13: Use Case Diagram of SQAS with Actor QUESTION AUTHOR & SYSTEM

The use case diagram of SQAS with actors Question Reviewer, Question Author, DGS, DGS Officer & Chief Examiner is given in Figure 3.14.

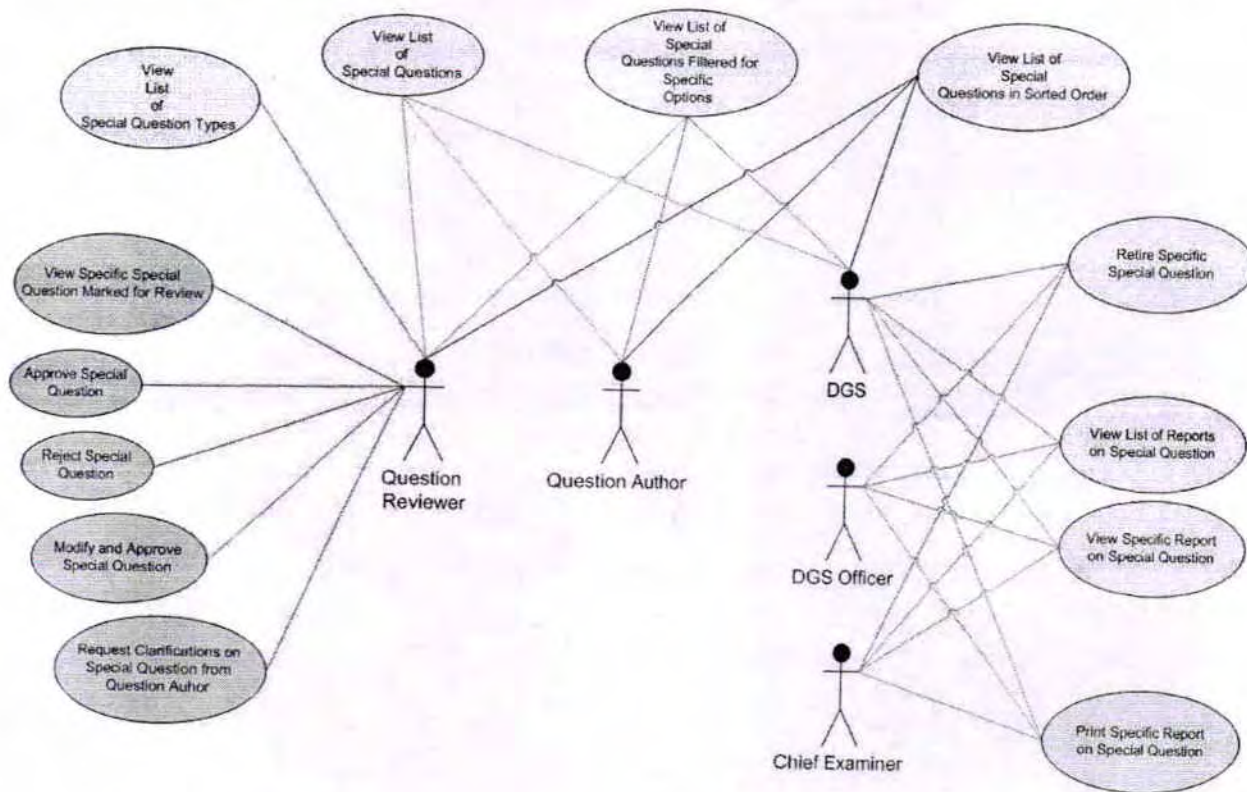


Fig.3.13: Use Case Diagram of SQAS with Actor QUESTION REVIEWER, QUESTION AUTHOR, DGS, DGS OFFICER & CHIEF EXAMINER

3.2.5 Use Cases in ECS

The list of various cases identified in the process of object oriented analysis of the Examination Configuration Subsystem (ECS) is described in Table 3.5 below.

Use Case ID	Subsystem	Use Case	Actor(s)
UC.E.1	ECS	Log into the DGS Portal	Examination Author, Examination Reviewer
UC.E.2	ECS	Authenticate login into the DGS portal	System
UC.E.2.1	ECS	Process Valid Login into the DGS portal	System
UC.E.2.2	ECS	Process Invalid Login into the DGS portal	System
UC.E.3	ECS	Display Home Page after Login	System
UC.E.3.1	ECS	Display ECS Home Page after Login for Examination Author	System
UC.E.3.2	ECS	Display ECS Home Page after Login for Examination Reviewer	System
UC.E.4	ECS	Create a New Examination Pattern	Examination Author
UC.E.4.1	ECS	Save Current Examination Pattern Worked On	Examination Author
UC.E.4.2	ECS	Save Current Examination Pattern Post Validation	System
UC.E.4.3	ECS	Process Invalid Examination Pattern	System
UC.E.5	ECS	View List of Examination Patterns	Examination Author
UC.E.5.1	ECS	View List of Examination Patterns Filtered for Specific Options	Examination Author
UC.E.5.2	ECS	View List of Examination Patterns in Sorted Order	Examination Author
UC.E.6	ECS	View Specific Examination Pattern	Examination Author
UC.E.7	ECS	Modify Specific Examination Pattern	Examination Author

UC.E.8	ECS	Submit Specific Examination Pattern for Review	Examination Author
UC.E.9	ECS	View List of Examination Patterns Marked for Review	Examination Reviewer
UC.E.10	ECS	View Specific Examination Pattern Marked for Review	Examination Reviewer
UC.E.11	ECS	Approve Examination Pattern As-Is	Examination Reviewer
UC.E.12	ECS	Suggest Modifications to Examination Pattern	Examination Reviewer
UC.E.13	ECS	Modify and Approve Examination Pattern	Examination Reviewer
UC.E.14	ECS	Reject Examination Pattern	Examination Reviewer
UC.E.15	ECS	Generate Sample Paper for Examination Pattern	Examination Author; Examination Reviewer; Chief Examiner
UC.E.15.1	ECS	Print Sample Paper for Examination Pattern	Examination Author; Examination Reviewer; Chief Examiner
UC.E.16	ECS	Print Examination Pattern	Examination Author; Examination Reviewer; Chief Examiner
UC.E.17	ECS	Make an Examination Pattern Active	Chief Examiner

Table 3.5: List of Use Cases in ECS

The use case descriptions for each one of the use cases as in Table 3.5 above in ECS are given below.

UC.E.1: Log into the DGS portal (Actor: Examination Author, Examination Reviewer)

1. Actor accesses DGS web portal.
2. System displays portal login page.
3. Actor fills his/her credentials (userid, password and role) and submits.

UC.E.2: Authenticate Login into the DGS portal (Actor: System)

This use case is triggered by UC.E.1.

1. System authenticates the userid, password and role as submitted.

UC.E.2.1: Process Valid Login into the DGS portal (Actor: System)

This use case is triggered by UC.E.2 (Authenticate Login into the DGS portal).

Here, all the fields submitted by the Actor for login into the DGS portal are valid.

1. System logs the Actor into the system
2. System displays Actor's home page. Each Actor will have a personalized home page.

UC.E.2.2: Process Invalid Login into the DGS portal (Actor: System)

This use case is triggered by UC.E.2 (Authenticate Login into the DGS portal).

Here, either the userid or password submitted for login into the DGS portal is invalid.

1. System displays the login form, with the userid filled and indicates that an error was encountered during login (Message: "Invalid userid or password").
2. Actor attempting login can resubmit the login form after correcting the fields.
3. System performs the authentication using the updated fields.



UC.E.3: Display ECS Home Page after Login (Actor: System)

1. System displays ECS Home page after Login with a menu of options based on user who has logged in.

UC.E.3.1: Display ECS Home Page after Login for Examination Author (Actor: System)

1. System displays ECS Home page after Login with a menu of options for Examination Author. The page contains the following menu of options: (a) Create a New Examination Pattern for a Paper (b) View List of Examination Patterns

UC.E.3.2: Display ECS Home Page after Login for Examination Reviewer (Actor: System)

1. System displays ECS Home page after Login with a menu of options for Examination Reviewer. The page contains the following menu of options: (a) View List of Examination Patterns Marked for Review.

UC.E.4: Create a New Examination Pattern (Actor: Examination Author)

1. Actor selects the "Create a New Examination Pattern".
2. System displays a list of Function/Paper combinations for which the Actor can create a new examination pattern.
3. Actor selects the Function/Paper and starts the creation of the new pattern.
4. System displays fields to allow the Actor to specify (a) Maximum marks for the examination (b) Maximum duration of the examination
5. Actor specifies maximum marks for the examination, maximum duration of the examination and submits.
6. System displays an interface which enables the Actor to specify the examination pattern. At any stage of the Examination Pattern, system will display a list of Question Templates that have been added to the Examination pattern. For each item on the list, the system will provide the following options:
 - Delete the specific Question Template
 - Modify the specific Question Template

Each Question Template in the pattern will include the following: (a) Question Category (b) Question Type (c) Topic / Sub-Topic that the question will belong to (d) Level of difficulty (E) Marks associated with specific question. The various parameters to specify for the examination pattern would be exhaustive and complete enough so that the pattern can be used to generate examination papers that are different for each candidate and yet be shown as equivalent in terms of coverage, level of difficulty, use of question types, and examination of competencies.

7. System will also provide the following options:

- Add an Question Template
- Save Current Examination Pattern Worked On

UC.E.4.1: Save Current Examination Pattern Worked On (Actor: Examination Author)

1. Examination Author chooses to save current examination pattern being worked on.
2. System performs certain validations to ensure that the integrity of the examination pattern is maintained.

UC.E.4.2: Save Current Examination Pattern Post Validation (Actor: System)

This use case is triggered by UC.E.4.1 (Save Current Examination Pattern Worked On).

In this case, there are no errors found during the validation of the examination pattern.

1. System saves the examination pattern in the database.

UC.E.4.3: Process Invalid Examination Pattern (Actor: System)

This use case is triggered by UC.E.4.1 (Save Current Examination Pattern Worked On).

In this case, the system found certain issues while performing the validation of the examination pattern.

1. System warns Examination Author of inconsistencies and asks for action dealing with this.
2. Examination Author makes the necessary changes in the parameters for the examination pattern and chooses to save.
3. System saves the examination pattern in the database.

UC.E.5: View List of Examination Patterns (Actor: Examination Author)

1. Actor chooses to view list of examination patterns.
2. System displays list of examination patterns. System will only display those examination patterns that the Actor has permission for. System will provide the Actor with the following options for each of the patterns (a) View specific examination pattern (b) Modify specific examination pattern (c) Submit examination pattern for approval.

UC.E.5.1: View List of Examination Patterns Filtered for Specific Options (Actor: Examination Author)

This use case is triggered by UC.E.5 (View List of Examination Patterns).

1. Actor chooses to filter list based on (a) Pattern IDNO (b) Grade (c) Paper (d) Date range authored (e) Date range approved (f) Status as active or inactive
2. System displays list with only examination patterns matching selected filter.

UC.E.5.2: View List of Examination Patterns in Sorted Order (Actor: Examination Author)

This use case is triggered by UC.E.5 (View List of Examination Patterns).

1. Actor chooses to sort list based on (a) Pattern IDNO (b) Grade (c) Paper (d) Date range authored (e) Date range approved (f) Status as active or inactive
2. System will display the list of examination patterns in selected sorted order.

UC.E.6: View Specific Examination Pattern (Actor: Examination Author)

1. Actor selects the "View Specific Examination Pattern" option for a specific examination pattern.
2. System displays selected examination pattern in a non-editable mode. System also provides Actor with option to modify the examination pattern.

UC.E.7: Modify Specific Examination Pattern (Actor: Examination Author)

1. Actor selects the "Modify an Existing Examination Pattern" option for a specific examination pattern.

2. System displays a list of Examination Patterns that the Actor can modify. System also displays a "Modify Examination Pattern" option. Actor would be able to modify only those examination patterns that he/she created. It is possible that only a specified set of fields of the examination pattern may be modifiable. For instance, the examination pattern would have a unique IDNO and Title that may not be modified.
3. Actor selects a specific Examination Pattern and selects the "Modify Examination Pattern" option.
4. System displays fields to allow the Actor to modify (a) Maximum marks for the examination (b) Maximum duration of the examination
5. Actor modifies maximum marks for the examination, maximum duration of the examination and number of questions as required and submits.
6. System displays an interface which enables the Actor to modify the examination pattern. At any stage of the Examination Pattern, system will display a list of Question Templates that have been added to the Examination pattern. For each item on the list, the system will provide the following options:
 - Delete the specific Question Template
 - Modify the specific Question Template

Each Question Template in the pattern will include the following: (a) Question Category (b) Question Type (c) Topic / Sub-Topic that the question will belong to (d) Level of difficulty (E) Marks associated with specific question. The various parameters to specify for the examination pattern would be exhaustive and complete enough so that the pattern can be used to generate examination papers that are different for each candidate and yet be shown as equivalent in terms of coverage, level of difficulty, use of question types, and examination of competencies.

7. System will also provide the following options:
 - Add a Question Template
 - Save Current Examination Pattern Worked On
8. Actor makes the necessary modifications and submits.
9. System saves the modifications in the examination pattern in the database.



UC.E.8: Submit Examination Pattern for Review (Actor: System)

1. Examination Author selects the "Submit Examination Pattern for Review" option for a specific examination pattern. Examination Author can only submit a pattern that he/she authored.
2. System marks the specific examination pattern as "To Be Reviewed".
3. System sends a message to Examination Reviewer that there is an authored examination to be reviewed.

UC.E.9: View List of Examination Patterns Marked for Review (Actor: Examination Reviewer)

1. Examination Reviewer selects "View List of Examination Patterns Marked for Review" option.
2. System displays the list of all examination patterns marked for review.

UC.E.10: View Specific Examination Pattern Marked for Review (Actor: Examination Reviewer)

1. Examination Reviewer selects specific examination pattern to review.
2. System displays the details of the examination pattern to be reviewed.
3. System displays the following menu of options (a) Approve Examination Pattern (b) Suggest Modifications in Examination Pattern (c) Modify Examination Pattern (d) Reject an Examination pattern (e) Generate sample paper for pattern (f) Print Examination Pattern

UC.E.11: Approve Examination Pattern As-Is (Actor: Examination Reviewer)

1. Examination Reviewer selects "Approve Examination Pattern" option.
2. System marks the Examination pattern as "Approved" in the database.
3. System sends a message to Examination Author that the Examination Pattern he/she submitted has been approved as-is.

UC.E.12: Suggest Modifications in Reviewed Examination Pattern (Actor: Examination Reviewer)

1. Examination Reviewer selects "Suggest Modifications in Examination Pattern" option.
2. System displays a form where Examination Reviewer can suggest the modifications.
3. Examination Reviewer fills up the suggested modifications and submits.
4. System saves the suggested modifications in the database.
5. System sends message to Examination Author that the Examination Reviewer has suggested modifications for the submitted examination pattern.
6. System saves the examination pattern in the "Modifications Suggested" state.

UC.E.13: Modify and Approve an Examination Pattern (Actor: Examination Reviewer)

1. Examination Reviewer selects "Modify and Approve Examination Pattern" option. Examination Reviewer uses this option only if the modifications to be made are very minor and to expedite the process of finalizing an examination pattern. Examination Reviewer would provide suggestions for modifications to an examination pattern if the modifications are not minor as in Use Case 12.
2. System displays the examination pattern parameters in an editable mode.
3. Examination Reviewer makes modifications in the examination pattern and chooses to approve.
4. System saves the changes for the examination pattern in the database and marks the examination pattern as approved.
5. System sends a message to Examination Author that the examination pattern he/she submitted has been approved with modifications listed.

UC.E.14: Reject Examination Pattern (Actor: Examination Reviewer)

1. Examination Reviewer selects "Reject Examination Pattern" option. This is done only in extreme circumstances when the examination pattern is irreconcilably cannot be just modified to be compliant with examination goals.
2. System displays a form requesting for confirmation of the rejection and reasons for the same.
3. Examination Reviewer provides reasons for rejection and confirms the action.

4. System marks the examination pattern as "Rejected" and sends a message to Examination Author with the Examination Reviewer's reasons for the action.

UC.E.15: Generate Sample Paper for Examination Pattern (Actors: Examination Author; Examination Reviewer; Chief Examiner)

1. Actor chooses "Generates Sample Paper for Examination Pattern" option. This is done primarily to test whether the examination pattern specified works as intended.
2. System generates the sample assessment paper based on selected examination pattern and displays the paper.
3. System provides a "Print Sample Paper" option for Actor to print the sample paper.

UC.E.15.1: Print Sample Paper for Examination Pattern (Actors: Examination Author; Examination Reviewer; Chief Examiner)

1. Actor chooses "Print Sample Paper" option.
2. System prints the sample assessment paper.

UC.E.16: Print Examination Pattern (Actors: Examination Author; Examination Reviewer; Chief Examiner)

1. Actor chooses "Print Examination Pattern" option.
2. System prints the selected examination pattern.

UC.E.17: Make an Examination Pattern Active (Actor: Chief Examiner)

1. Chief Examiner views a list of available examination patterns, selects one, and makes that selected Examination Pattern Active.
2. System displays a warning message that the previously active examination pattern for that paper will be now replaced with the selected examination pattern and seeks confirmation for the same. Note: Only one examination pattern may be active for a paper at any point in time.
3. Chief Examiner confirms the action.
4. System commits the changes to the database.

The use case diagrams in UML for ECS is provided in one single diagram in Figure 3.15.

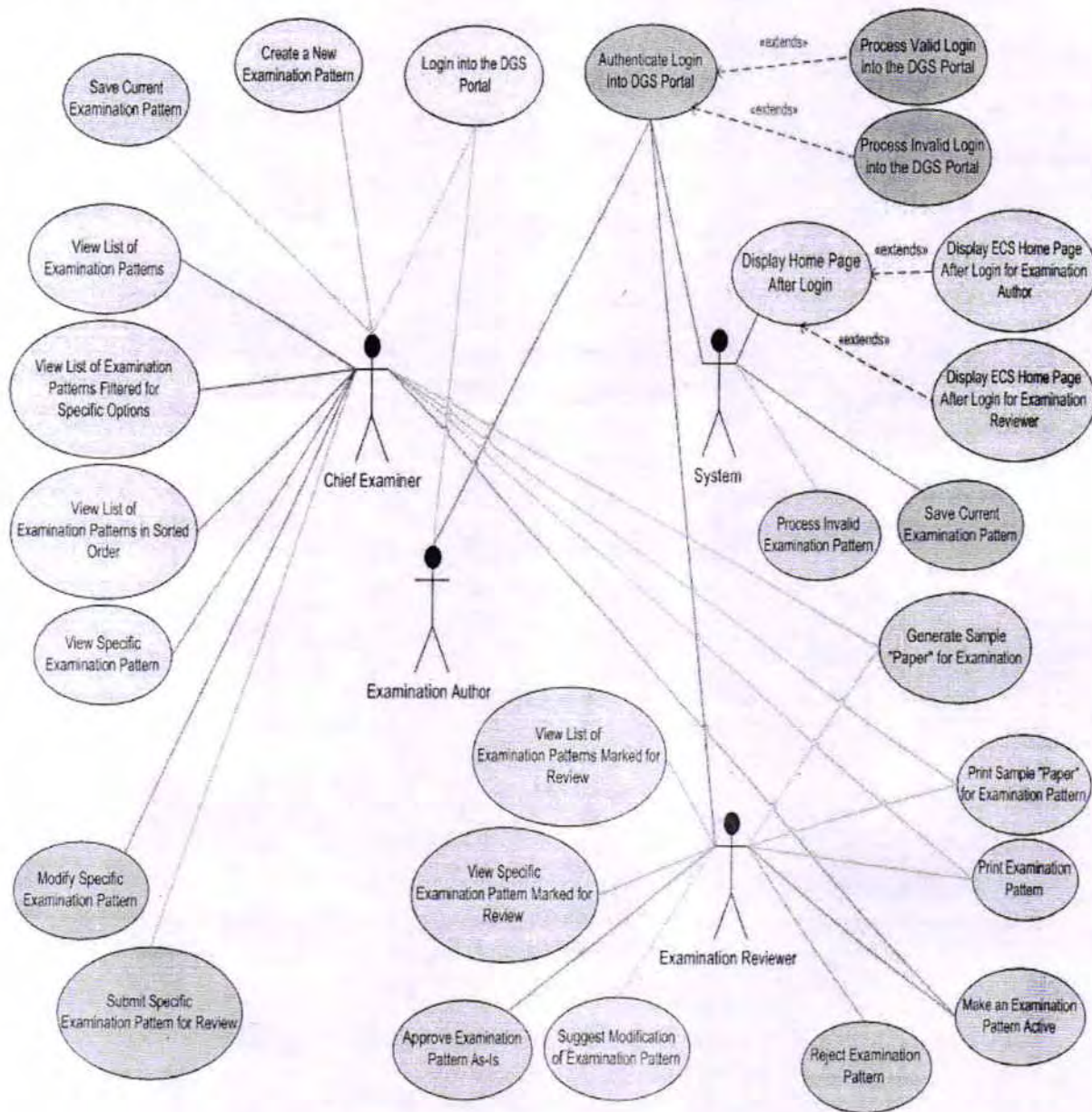


Fig. 3.15: Use Case Diagram of ECS with All Actors

3.2.6 Use Cases in ARAS

The list of various cases identified in the process of object oriented analysis of the Examination Configuration Subsystem (ARAS) is described in Table 3.6 below.

Use Case ID	Subsystem	Use Case	Actor(s)
UC.F.1	ARAS	Login to DGS Portal	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.2	ARAS	Authenticate Login into the DGS portal	System
UC.F.2.1	ARAS	Process Valid Login into the DGS portal	System
UC.F.2.2	ARAS	Process Invalid Login into the DGS portal	System
UC.F.3	ARAS	Display DGS Portal Home Page after Login	System
UC.F.3.1	ARAS	Display DGS Portal Home Page after Login for DGS Admin	System
UC.F.3.2	ARAS	Display DGS Portal Home Page after Login for DGS-Officer	System
UC.F.3.3	ARAS	Display Menu Options for Chief Examiner	System
UC.F.3.4	ARAS	Display DGS Portal Home Page after Login for DGS	System
UC.F.4	ARAS	Manage Examination Centers	DGS-Admin
UC.F.5	ARAS	Setup a New Examination Center	DGS-Admin
UC.F.6	ARAS	List All Examination Centers	DGS-Admin
UC.F.7	ARAS	Display Details of Specific Examination Center	DGS-Admin
UC.F.8	ARAS	Print Details of Specific Examination Center	DGS-Admin
UC.F.9	ARAS	Modify Details of Specific Examination Center	DGS-Admin
UC.F.10	ARAS	Manage Users at Examination Center	DGS-Admin
UC.F.11	ARAS	Create New User at	DGS-Admin

UC.F.12	ARAS	Examination Center Display All Users at Examination Center	DGS-Admin
UC.F.13	ARAS	Display Details of Specific User at Examination Center	DGS-Admin
UC.F.14	ARAS	Modify Details of Specific User at Examination Center	DGS-Admin
UC.F.15	ARAS	Suspend Specific User at Examination Center	DGS-Admin
UC.F.16	ARAS	View Activities of Specific User at Examination Center	DGS-Admin
UC.F.17	ARAS	Print Activities of Specific User at Examination Center	DGS-Admin
UC.F.18	ARAS	Manage Users at DGS	DGS-Admin
UC.F.19	ARAS	Create New User at DGS	DGS-Admin
UC.F.20	ARAS	Display All Users at DGS	DGS-Admin
UC.F.21	ARAS	Display Details of Specific User at DGS	DGS-Admin
UC.F.22	ARAS	Modify Details of Specific User at DGS	DGS-Admin
UC.F.23	ARAS	Suspend Specific User at DGS	DGS-Admin
UC.F.24	ARAS	View Activities of Specific User at DGS	DGS-Admin
UC.F.25	ARAS	Print Activities of Specific User at DGS	DGS-Admin
UC.F.26	ARAS	Manage Databases at DGS	DGS-Admin
UC.F.27	ARAS	View List of Databases at DGS	DGS-Admin
UC.F.28	ARAS	Initialize a Specific Database at DGS	DGS-Admin
UC.F.29	ARAS	Backup a Specific Database at DGS	DGS-Admin
UC.F.30	ARAS	Restore a Specific Database at DGS	DGS-Admin
UC.F.31	ARAS	Perform Integrity Check on a Specific Database at DGS	DGS-Admin
UC.F.32	ARAS	Lock a Specific Database at DGS	DGS-Admin
UC.F.33	ARAS	Unlock a Specific	DGS-Admin

		Database at DGS	
UC.F.34	ARAS	Synchronize Question Database at DGS with Examination Centers	DGS-Admin
UC.F.35	ARAS	View List of Regular Reports	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.35.1	ARAS	View List of Regular Reports on Questions	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.35.2	ARAS	View List of Regular Reports on Examinations	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.35.3	ARAS	View List of Regular Reports on Candidates	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.35.4	ARAS	View List of Regular Reports on Examination Centers	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.35.5	ARAS	View a Specific Regular Report	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.35.6	ARAS	Print a Specific Regular Report	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.36	ARAS	View List of Analytical Reports	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.36.1	ARAS	View List of Analytical Reports on Questions	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.36.2	ARAS	View List of Analytical Reports on Examinations	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.36.3	ARAS	View List of Analytical	DGS-Admin;

		Reports on Candidates	DGS-Officer; Chief Examiner; DGS
UC.F.36.4	ARAS	View List of Analytical Reports on Examination Centers	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.36.5	ARAS	View a Specific Analytical Report	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.36.6	ARAS	Print a Specific Analytical Report	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.37	ARAS	Query Databases	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.37.1	ARAS	Query Assessment Database	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.37.2	ARAS	Query Candidate Database	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.37.3	ARAS	Query Examination Database	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38	ARAS	View Audit Trails	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.1	ARAS	View Audit Trails in Questions Authoring & Review Activities	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.2	ARAS	View Audit Trails in Examinations Center Activities	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.3	ARAS	View Audit Trails in Examination Activities	DGS-Admin; DGS-Officer;

			Chief Examiner; DGS
UC.F.38.4	ARAS	View Audit Trails in Candidates & Candidate Examination Activities	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.5	ARAS	View Audit Trails in Query Activities	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.6	ARAS	View Audit Trails in Report Generation Activities	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.7	ARAS	View Audit Trails in DGS Administration Activities	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.8	ARAS	View a Specific Audit Trail Report	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.9	ARAS	Print a Specific Audit Trail Report	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.39	ARAS	View Booking/Utilization Report for a Specific Examination Center	DGS-Admin; DGS-Officer; Chief Examiner; DGS
UC.F.38.9	ARAS	Print Booking/Utilization Report for a Specific Examination Center	DGS-Admin; DGS-Officer; Chief Examiner; DGS

Table 3.6: List of Use Cases in ARAS

The use case descriptions for each one of the use cases as in Table 3.6 above in ARAS are given below.

UC.F.1 Login to DGS Portal (Actor: DGS-Admin, DGS-Officer, Chief Examiner, DGS)

1. Actor accesses the DGS web portal.
2. System displays login page.
3. Actor fills in his/her credentials (userid, password and role) and submits.

UC.F.2: Authenticate Login into the DGS portal (Actor: System)

This use case is triggered by UC.F.1

1. System authenticates the userid, password and role as submitted by the user attempting login.

UC.F.2.1: Process Valid Login into the DGS portal (Actor: System)

This use case is triggered by UC.F.2 (Authenticate Login into the DGS portal).

Here, all the fields submitted by the Actor for login into the DGS portal are valid.

1. System logs the Actor into the system
2. System displays Actor's home page. Each Actor will have a personalized home page.

UC.F.2.2: Process Invalid Login into the DGS portal (Actor: System)

This use case is triggered by UC.F.2 (Authenticate Login into the DGS portal).

Here, either the userid or password submitted for login into the DGS portal is invalid.

1. System displays the login form, with the userid filled and indicates that an error was encountered during login (Message: "Invalid userid or password").
2. Actor attempting login can resubmit the login form after correcting the fields.
3. System performs the authentication using the updated fields.



UC.F.3: Display DGS Portal Home Page after Login (Actor: System)

1. System displays DGS Portal Home Page after Login of actor.

UC.F.3.1: Display DGS Portal Home Page after Login for DGS-Admin (Actor: System)

1. System displays DGS Home Page after login for DGS-Admin. Page contains the following menu of options (a) Manage Examination Centers (b) Manage Users at DGS (c) Manage Databases at DGS (d) Manage Regular Reports (e) Manage Analytics Based Reports (f) Query Assessment Databases (g) Query Candidates Databases (h) Query Examinations Databases (i) View Audit Trails

UC.F.3.2: Display DGS Portal Home Page after Login for DGS-Officer (Actor: System)

1. System displays DGS Home Page after login for DGS-Officer. Page contains the following menu of options (a) Manage Regular Reports (b) Manage Analytics Based Reports (c) Query Assessment Databases (d) Query Candidates Databases (e) Query Examinations Databases (f) View Audit Trails

UC.F.3.3: Display DGS Portal Home Page after Login for Chief Examiner (Actor: System)

1. System displays DGS Home Page after login for Chief Examiner. Page contains the following menu of options (a) Manage Regular Reports (b) Manage Analytics Based Reports (c) Query Assessment Databases (d) Query Candidates Databases (e) Query Examinations Databases (f) View Audit Trails

UC.F.3.4: Display DGS Portal Home Page after Login for DGS (Actor: System)

1. System displays DGS Home Page after login for DGS. Page contains the following menu of options (a) Manage Regular Reports (b) Manage Analytics Based Reports (c) Query Assessment Databases (d) Query Candidates Databases (e) Query Examinations Databases (f) View Audit Trails

UC.F.4: Manage Examination Centers (Actor: DGS-Admin)

1. Actor selects "Manage Examination Centers" option.
2. System displays a list of options available to Actor to manage examination centers. The options are (a) Setup New Examination Center (b) View List of Examination Centers (c) View Booking/Utilization Report for a Specific Examination Center

UC.F.5: Setup New Examination Center (Actor: DGS-Admin)

1. Actor selects "Setup New Examination Center" option.
2. System displays a form requesting details of the new examination center. Setting up new examination center requires the central database to contain the various details pertaining to the new examination center. The details of new examination center include (a) Examination Center Name (b) Examination Center Name (c) Examination Center Contact Details (d) Examination Center Seat Capacity (e) Examination Center Manager (f) Examination Center Administrator (g) Date of initial availability (h) Network details.
3. Actor fills in the details of the new examination center.
4. System adds new examination center in the database, with details as given by Actor.

UC.F.6: View List of Examination Centers (Actor: DGS-Admin)

1. Actor chooses the "View List of Examination Centers" option.
2. System displays a list of all the examination centers. System also provides the following options (a) View Details of Specific Examination Center (b) Print Details of Specific Examination Center (c) Modify Details of Specific Examination Center (d) Manage Users at Specific Examination Center

UC.F.7: View Details of Specific Examination Center (Actor: DGS-Admin)

1. Actor chooses the "View Details of Specific Examination Center" option.
2. System displays the details for the specific examination center in a non-editable mode.

UC.F.8: Print Details of Specific Examination Center (Actor: DGS-Admin)

1. Actor chooses the "Print Details of Specific Examination Center" option.
2. System prints the details for the specific examination center.



UC.F.9: Modify Details of Specific Examination Center (Actor: DGS-Admin)

1. Actor chooses the "Modify Details of Specific Examination Center" option.
2. System displays the details for the specific examination center in an editable mode. Only a subset of all available details on examination center will be editable.
3. Actor modifies the data as required and submits.
4. System validates the modified details and updates the database.

UC.F.10: Manage Users at Specific Examination Center (Actor: DGS-Admin)

1. Actor chooses the "Manage Users at Specific Examination Center" option.
2. System displays a menu of options available for Actor: (a) Create New User at Examination Center (b) View List of Users at Examination Center

UC.F.11: Create New User at Specific Examination Center (Actor: DGS-Admin)

1. Actor chooses the "Create New User at Specific Examination Center" option.
2. System displays form requesting for details of user (user name, email id, role, etc.)
3. Actor fills all necessary details of user and submits.
4. System performs necessary validations.
5. System creates new user in the database after validation.

UC.F.12: View List of Users at Specific Examination Center (Actor: DGS-Admin)

1. Actor chooses the "View List of Users at Specific Examination Center" option.
2. System displays a list of all users at the selected examination center. System also provides the following options (a) View Details of Specific User at Examination Center (b) Modify Details of Specific User at Examination Center (c) Suspend Specific User at Examination Center (d) View Activities of Specific User at Examination Center (e) Print Activities of Specific User at Examination Center.

UC.F.13: View Details of Specific User at Examination Center (Actor: DGS-Admin)

1. Actor chooses the "View Details of Specific User at Examination Center" option.
2. System displays the details for the user at specific examination center in a non-editable mode.

UC.F.14: Modify Details of Specific User at Examination Center (Actor: DGS-Admin)

1. Actor chooses the "Modify Details of Specific User at Examination Center" option.
2. System displays the details for the user at specific examination center in an editable mode. Only a subset of the details of user can be modified.
3. Actor modifies the data as required.
4. System performs necessary validations.
5. System updates the database with the modified details after validation.

UC.F.15: Suspend Specific User at Examination Center (Actor: DGS-Admin)

1. Actor chooses the "Suspend Specific User at Examination Center" option.
2. System displays the details for the user at specific examination center in a non-editable mode and seeks confirmation of the action.
3. Actor confirms action.
4. System marks the specific user as "Suspended" in the database.

UC.F.16: View Activities of Specific User at Examination Center (Actor: DGS-Admin)

1. Actor chooses the "View Activities of Specific User at Examination Center" option.
2. System displays the option to select a specific range of dates.
3. Actor selects a specific range of dates and submits.
4. System displays the activities of specific user for the range of dates selected. System also provides the Actor with an option to print this report of activities.

UC.F.17: Print Activities of Specific User at Examination Center (Actor: DGS-Admin)

1. Actor chooses the "Print Activities of Specific User at Examination Center" option.
2. System displays the option to select a specific range of dates.
3. Actor selects a specific range of dates and submits.
4. System prints a report of the activities of specific user for the range of dates selected.

UC.F.18: Manage Users at DGS (Actor: DGS-Admin)

1. Actor chooses the "Manage Users at DGS" option.
2. System displays a menu of options available for Actor: (a) Create New User at DGS (b) View List of Users at DGS

UC.F.19: Create New User at DGS (Actor: DGS-Admin)

1. Actor chooses the "Create New User at DGS" option.
2. System displays form requesting for details of user (user name, email id, role, etc.)
3. Actor fills all necessary details of user and submits.
4. System performs necessary validations.
5. System creates new user in the database after validation.

UC.F.20: View List of Users at DGS (Actor: DGS-Admin)

1. Actor chooses the "View List of Users at DGS" option.
2. System displays a list of all users at the selected examination center. System also provides the following options (a) View Details of Specific User at DGS (b) Modify Details of Specific User at DGS (c) Suspend Specific User at DGS (d) View Activities of Specific User at DGS (e) Print Activities of Specific User at DGS.

UC.F.21: View Details of Specific User at DGS (Actor: DGS-Admin)

1. Actor chooses the "View Details of Specific User at DGS" option.
2. System displays the details for the user at DGS in a non-editable mode.

UC.F.22: Modify Details of Specific User at DGS (Actor: DGS-Admin)

1. Actor chooses the "Modify Details of Specific User at DGS" option.
2. System displays the details for the user at DGS in an editable mode. Only a subset of the details of user can be modified.
3. Actor modifies the data as required.
4. System performs necessary validations.
5. System updates the database with the modified details after validation.

UC.F.23: Suspend Specific User at DGS (Actor: DGS-Admin)

1. Actor chooses the "Suspend Specific User at DGS" option.
2. System displays the details for the user at DGS in a non-editable mode and seeks confirmation of the action.
3. Actor confirms action.
4. System marks the specific user as "Suspended" in the database.

UC.F.24: View Activities of Specific User at DGS (Actor: DGS-Admin)

1. Actor chooses the "View Activities of Specific User at DGS" option.
2. System displays the option to select a specific range of dates.
3. Actor selects a specific range of dates and submits.
4. System displays the activities of specific user for the range of dates selected. System also provides the Actor with an option to print this report of activities.

UC.F.25: Print Activities of Specific User at DGS (Actor: DGS-Admin)

1. Actor chooses the "Print Activities of Specific User at DGS" option.
2. System displays the option to select a specific range of dates.
3. Actor selects a specific range of dates and submits.
4. System prints a report of the activities of specific user for the range of dates selected.

UC.F.26: Manage Databases at DGS (Actor: DGS-Admin)

1. Actor selects "Manage Databases at DGS" option.



2. System presents a list of options available to Actor to manage all databases. The options are (a) View List of Databases (b) Synchronize Question Database at DGS with Examination Centers.

UC.F.27: View List of Users at DGS (Actor: DGS-Admin)

1. Actor chooses the "View List of Databases at DGS" option.
2. System displays a list of all databases available at DGS. System also provides the following options (a) Initialize a Specific Database at DGS (b) Backup a Specific Database at DGS (c) Restore a Specific Database at DGS (d) Perform Integrity Check on a Specific Database at DGS (e) Lock a Specific Database at DGS (f) Unlock a Specific Database at DGS. These options will be listed against each database. Some of these options may be enabled / disabled based on the status of each database.

UC.F.28: Initialize a Specific Database at DGS (Actor: DGS-Admin)

1. Actor chooses "Initialize a Specific Database at DGS" option for a specific database.
2. System initializes the selected database after checking authorization and confirmation to initialize after warning.

UC.F.29: Backup a Specific Database (Actor: DGS-Admin)

1. Actor chooses "Backup a Specific Database at DGS" option for a specific database.
2. System backs up the selected database after checking authorization and confirmation.

UC.F.30: Restore a Specific Database at DGS (Actor: DGS-Admin)

1. Actor chooses "Restore a Specific Database at DGS" option for a specific database.
2. System displays the backup versions available for selected database.
3. Actor selects the backup version from which the restore operation should be done.
4. System restores the selected database after checking authorization and confirmation.

UC.F.31: Perform Integrity Check on a Specific Database at DGS (Actor: DGS-Admin)

1. Actor chooses "Perform Integrity Check on a Specific Database at DGS" option for a specific database.
2. System performs the integrity check and displays a report.

UC.F.32: Lock a Specific Database at DGS (Actor: DGS-Admin)

1. Actor chooses "Lock a Specific Database at DGS" option for a specific database.
2. System locks the selected database after checking authorization and confirmation. No user in the DGS can make use of the applications when the databases are locked.

UC.F.33: Unlock a Specific Database at DGS (Actor: DGS-Admin)

1. Actor chooses "Unlock a Specific Database at DGS" option for a specific database.
2. System unlocks the selected database after checking authorization and confirmation.

UC.F.34: Synchronize Question Database at DGS with Examination Centers (Actor: DGS-Admin)

1. Actor chooses "Synchronize Question Database at DGS with Examination Centers" option.
2. System displays a list of examination center for Actor to choose which centers to synchronize with.
3. Actor selects one or more examination centers for the synchronization.
4. System initiates the synchronization. None of the applications at DGS or at the examination center can function while the synchronization process is active.

UC.F.35: View List of Regular Reports (Actor: DGS-Admin)

1. Actor selects "View List of Regular Reports".
2. System provides the following menu of options (a) View List of Regular Reports on Questions (b) View List of Regular Reports on Examinations (c) View List of Regular Reports on Candidates (d) View List of Regular Reports on Examination Centers.

UC.F.35.1: View List of Regular Reports on Questions (Actor: DGS-Admin)



1. Actor chooses "View List of Regular Reports on Questions" option.
2. System displays a list of all regular, pre-defined reports concerning questions. *This list of regular, pre-defined reports on questions will be discussed and enumerated during the meeting with stakeholders on 2nd August 2010.*

UC.F.35.2: View List of Regular Reports on Examinations (Actor: DGS-Admin)

1. Actor chooses "View List of Regular Reports on Examinations" option.
2. System displays a list of all regular, pre-defined reports concerning questions. This list of regular, pre-defined reports on examinations will be discussed and enumerated during the meeting with stakeholders on 2nd August 2010.

The regular, pre-defined reports on Examinations are (a) Summary Report of Results of all Examinations of MEO Class IV during a specific period (b) Summary Report on Results of a Specific Examination of MEO Class IV during a Specific Period (c) Summary Report on Results of all Examinations of MEO Class IV from Specific Examination Center (d) Summary Report on Results of a Specific Examination of MEO Class IV from Specific Examination Center (e) Histogram of Results of all Examinations of MEO Class IV during a specific period (f) Histogram of Results of a Specific Examination of MEO Class IV during a Specific Period (g) Histogram of Results of a Specific Examination of MEO Class IV from Specific Examination Center.

UC.F.35.3: View List of Regular Reports on Candidates (Actor: DGS-Admin)

1. Actor chooses "View List of Regular Reports on Candidates" option.
2. System displays a list of all regular, pre-defined reports concerning questions. *This list of regular, pre-defined reports on candidates will be discussed and enumerated during the meeting with stakeholders on 2nd August 2010.*

The regular, pre-defined reports of candidates are (a) Summary report of candidates and their performance across specific grade & paper (b) Summary report of candidates and their performance across specific grade & paper within and specific date range (c) Summary report of candidates and their performance across specific grade & paper, within a specific date range, and from specific examination center (d) Summary report of candidates and their performance in all papers of a particular grade (e) Summary report of candidates and their performance in all papers of a particular grade, within a specific date range (f) Summary report of candidates and their performance in all papers of a particular grade, within a specific date range, in specific examination center (g) Summary report of performance of candidates who have passed specific Grade-Function-Paper (h) Summary report of performance of candidates

who have passed specific Grade-Function-Paper, within specific date range (i) Summary report of performance of candidates who have passed specific Grade-Function-Paper, within specific date range, in specific examination center (j) Summary report of performance of candidates who have failed specific Grade-Function-Paper (k) Summary report of performance of candidates who have failed specific Grade-Function-Paper, within specific date range (l) Summary report of performance of candidates who have failed specific Grade-Function-Paper, within specific date range, in specific examination center (m) Summary report of candidates who appeared in some examination within date range (n) Summary report of candidates who appeared in some examination within date range, in specific examination center (o) Summary report of candidates who appeared in specific Grade-Function-Paper examination within date range, in specific examination center (p) Summary report of candidates who appeared in specific Grade-Function-Paper examination within date range (q) Summary report of candidates who have passed any Grade-Function-Paper in specific number of attempts within date range (r) Summary report of candidates who have passed any Grade-Function-Paper in specific number of attempts within date range, in specific examination center.

UC.F.35.4: View List of Regular Reports on Examination Centers (Actor: DGS-Admin)

1. Actor chooses "View List of Regular Reports on Examination Centers" option.
2. System displays a list of all regular, pre-defined reports concerning questions. *This list of regular, pre-defined reports on examination centers will be discussed and enumerated during the meeting with stakeholders on 2nd August 2010.*

The regular, pre-defined reports on examination centers are (a) Summary report of activities in all examination centers during date range (b) Summary report of activities in specific examination center during date range (c) Summary utilization report of facilities across all examination centers during date range (d) Summary utilization report of facilities in specific examination center during date range (e) Summary of exceptional conditions at all examination centers in date range (f) Summary of exceptional conditions at specific examination center in date range.

UC.F.35.5: View a Specific Regular Report (Actor: DGS-Admin)

This use case is triggered from UC.F.35.1 or UC.F.35.2 or UC.F.35.3 or UC.F.35.4

1. Actor chooses to view a specific report from the list of regular reports displayed.
2. System generates and displays the specific regular report that the Actor has selected.

UC.F.35.6: Print a Specific Regular Report (Actor: DGS-Admin)



This use case is triggered from UC.F.35.5

1. Actor chooses to print the regular report displayed.
2. System prints the specific regular report.

UC.F.36: View List of Analytical Reports (Actor: DGS-Admin)

1. Actor selects "View List of Analytical Reports".
2. System provides the following menu of options (a) View List of Analytical Reports on Questions (b) View List of Analytical Reports on Examinations (c) View List of Analytical Reports on Examination Centers (d) View List of Analytical Reports on Candidates.

UC.F.36.1: View List of Analytical Reports on Questions (Actor: DGS-Admin)

1. Actor chooses "View List of Analytical Reports on Questions" option.
2. System displays a list of all analytical reports concerning questions. *This list of analytical reports on questions will be discussed and enumerated during the meeting with stakeholders on 2nd August 2010.*

The Analytical reports that will be available are: (a) Analytical report of available questions in database (b) Analytical report of available questions in database by question type and rendered in examinations in date range (c) Analytical report of available questions in database by question type and rendered in examinations in date range along with consolidated average performance by candidates in terms of attempted correctly, attempted incorrectly and not attempted (d) Analytical report of available questions in database by question type and rendered in examinations in date range along with consolidated average performance by candidates in terms of attempted correctly, attempted incorrectly and not attempted along with average times candidates took for answering them.

UC.F.36.2: View List of Analytical Reports on Examinations (Actor: DGS-Admin)

1. Actor chooses "View List of Analytical Reports on Examinations" option.
2. System displays a list of all analytical reports concerning examinations. *This list of analytical reports on examinations will discussed during the meeting with stakeholders on 2nd August 2010.*

The Analytical reports that will be available are: (a) Analytical report of candidate performance in specific Grade-Function-Paper consolidated (b) Analytical report of candidate performance

in specific Grade-Function-Paper in date range (c) Analytical report of candidate performance in specific Grade-Function-Paper in date range in specific examination center (d) Analytical report of candidate performance in specific Grade-Function-Paper based on state of origin (e) Analytical report of candidate performance in specific Grade-Function-Paper based on age (f) Analytical report of candidate performance in specific Grade-Function-Paper based on years of experience.

UC.F.36.3: View List of Analytical Reports on Examination Centers (Actor: DGS-Admin)

1. Actor chooses "View List of Analytical Reports on Examination Centers" option.
2. System displays a list of all analytical reports concerning examination centers. *This list of analytical reports on examination centers will discussed during the meeting with stakeholders on 2nd August 2010.*

The Analytical reports that will be available are: (a) Analytical report of bookings and utilization month-wise at examination centers (b) Analytical report of bookings and utilization for specific Grade-Function-Paper month-wise at examination centers (c) Analytical report of candidate performance in Grade-Function-Paper month-wise at examination centers (d) Analytical report of exceptional conditions occurrence and resolutions month-wise at examination centers.

UC.F.36.4: View List of Analytical Reports on Candidates (Actor: DGS-Admin)

1. Actor chooses "View List of Analytical Reports on Candidates" option.
2. System displays a list of all analytical reports concerning candidates. *This list of analytical reports on candidates will discussed during the meeting with stakeholders on 2nd August 2010.*

The Analytical reports that will be available are: (a) Analytical report of candidates performance in grade paper cross referenced with examination centers (b) Analytical report of candidates on performance in Grade-Function-Paper in topics (c) Analytical report of candidates on performance in Grade-Function-Paper in topics correlated with outcome of examination in Grade-Function-Paper (d) Analytical report of candidates performance in Grade-Function-Paper in topics correlated with performance in question types and outcome of examination.

UC.F.36.5: View a Specific Analytical Report (Actor: DGS-Admin)



This use case is triggered from UC.F.36.1 or UC.F.36.2 or UC.F.36.3 or UC.F.36.4

1. Actor chooses to view a specific report from the list of analytical reports displayed.
2. System generates and displays the specific analytical report that the Actor has selected.

UC.F.36.6: Print a Specific Analytical Report (Actor: DGS-Admin)

This use case is triggered from UC.F.36.5

1. Actor chooses to print the analytical report displayed.
2. System prints the specific analytical report.

UC.F.37: Query Databases (Actor: DGS-Admin)

1. Actor chooses "Query Databases" option.
2. System displays following menu of options (a) Query Assessment Database (b) Query Candidate Database (c) Query Examination Database

UC.F.37.1: Query Assessment Database (Actor: DGS-Admin)

1. Actor chooses "Query Assessment Database" option.
2. System displays a suitable interface to enable Actor to query the assessment database based on variety of selected fields.
3. Actor defines the query and submits.
4. System performs the query on the database and compiles the results.
5. System displays the results of the query.

UC.F.37.2: Query Candidate Database (Actor: DGS-Admin)

1. Actor chooses "Query Candidate Database" option.
2. System displays a suitable interface to enable Actor to query the candidate database based on variety of selected fields.
3. Actor defines the query and submits.
4. System performs the query on the database and compiles the results.
5. System displays the results of the query.

UC.F.37.3: Query Examination Database (Actor: DGS-Admin)

1. Actor chooses "Query Examination Database" option.
2. System displays a suitable interface to enable Actor to query the examination database based on variety of selected fields.
3. Actor defines the query and submits.
4. System performs the query on the database and compiles the results.
5. System displays the results of the query.

UC.F.38: View Audit Trails (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails" option.
2. System displays following options: (a) View Audit Trails in Questions Authoring & Review Activities (b) View Audit Trails in Examination Center Activities (c) View Audit Trails in Examinations (d) View Audit Trails in Candidates & Candidate Examinations (e) View Audit Trails in Query Activities (f) View Audit Trails in Report Generation Activities (g) View Audit Trails in DGS Administration Activities

UC.F.38.1: View Audit Trails in Questions Authoring & Review Activities (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails in Questions Authoring & Review Activities" option.
2. System displays available audit trail reports. The audit trail reports will be articulated after discussions with stakeholder on 2nd August 2010.

UC.F.38.2: View Audit Trails in Examination Center Activities (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails in Examination Center Activities" option.
2. System displays available audit trail reports. The audit trail reports will be articulated after discussions with stakeholder on 2nd August 2010.

UC.F.38.3: View Audit Trails in Examination Activities (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails in Examination Activities" option.
2. System displays available audit trail reports. The audit trail reports will be articulated after discussions with stakeholder on 2nd August 2010.



UC.F.38.4: View Audit Trails in Candidates & Candidate Examination Activities (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails in Candidates & Candidate Examination Activities" option.
2. System displays available audit trail reports. The audit trail reports will be articulated after discussions with stakeholder on 2nd August 2010.

UC.F.38.5: View Audit Trails in Query Activities (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails in Query Activities" option.
2. System displays available audit trail reports. The audit trail reports will be articulated after discussions with stakeholder on 2nd August 2010.

UC.F.38.6: View Audit Trails in Report Generation Activities (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails in Report Generation Activities" option.
2. System displays available audit trail reports. The audit trail reports will be articulated after discussions with stakeholder on 2nd August 2010.

UC.F.38.7: View Audit Trails in DGS Administration Activities (Actor: DGS-Admin)

1. Actor chooses "View Audit Trails in DGS Administration Activities" option.
2. System displays available audit trail reports. The audit trail reports will be articulated after discussions with stakeholder on 2nd August 2010.

UC.F.38.8: View a Specific Audit Trail Report (Actor: DGS-Admin)

This use case is triggered from UC.F.38.1 or UC.F.38.2 or UC.F.38.3 or UC.F.38.4 or UC.F.38.5 or UC.F.38.6 or UC.F.38.7.

1. Actor chooses to view a specific report from the list of audit trail reports displayed.
2. System generates and displays the specific audit trail report that the Actor has selected.

UC.F.38.9: Print a Specific Audit Trail Report (Actor: DGS-Admin)

This use case is triggered from UC.F.38.8.

1. Actor chooses to print the audit trail report displayed.
2. System prints the specific audit trail report.

UC.F.39: View Booking/Utilization Reports for a Specific Examination Center (Actor: DGS-Admin)

1. Actor chooses "View Booking/Utilization Reports for a Specific Examination Center" option.
2. System displays available examination centers and provides options for Actor to select a date range.
3. Actor selects a specific examination center and the date range.
4. System generates and displays the booking/utilization report for the specific center for the specified date range.

UC.F.39.1: Print Booking/Utilization Report for a Specific Examination Center (Actor: DGS-Admin)

This use case is triggered from UC.F.39.1.

1. Actor chooses to print the specific booking/utilization report displayed.
2. System prints the specific booking/utilization report.

The use case diagrams in UML for ARAS are provided in three different use case diagrams for readability instead of in one single diagram.

The use case diagram for ARAS involving the actor DGS Admin is depicted in Figure 3.16.

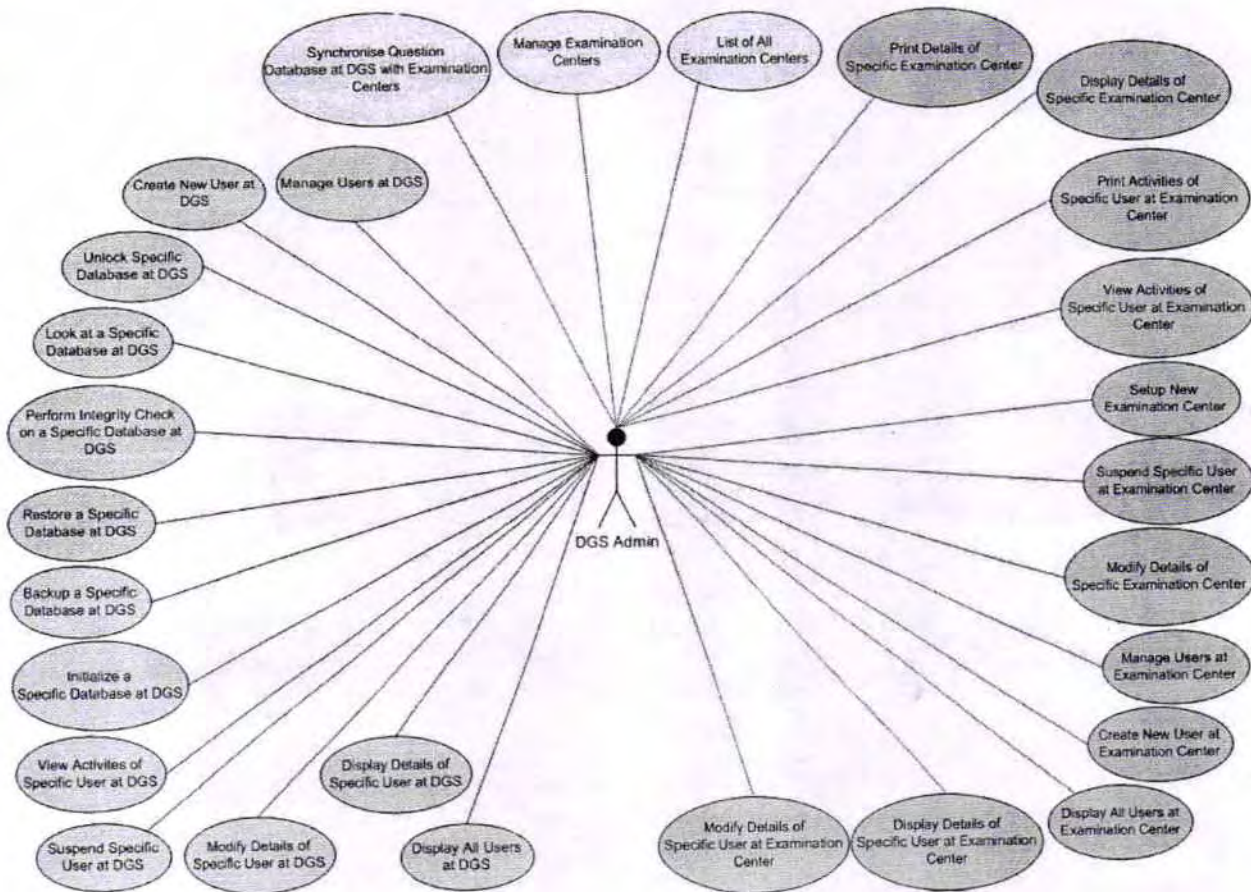


Fig.3.16: Use Case Diagram of ARAS with Actor DGS ADMIN

The use case diagram for ARAS involving the actors DGS, DGS Officer, DGS Admin and Chief Examiner is depicted in Figure 3.17.

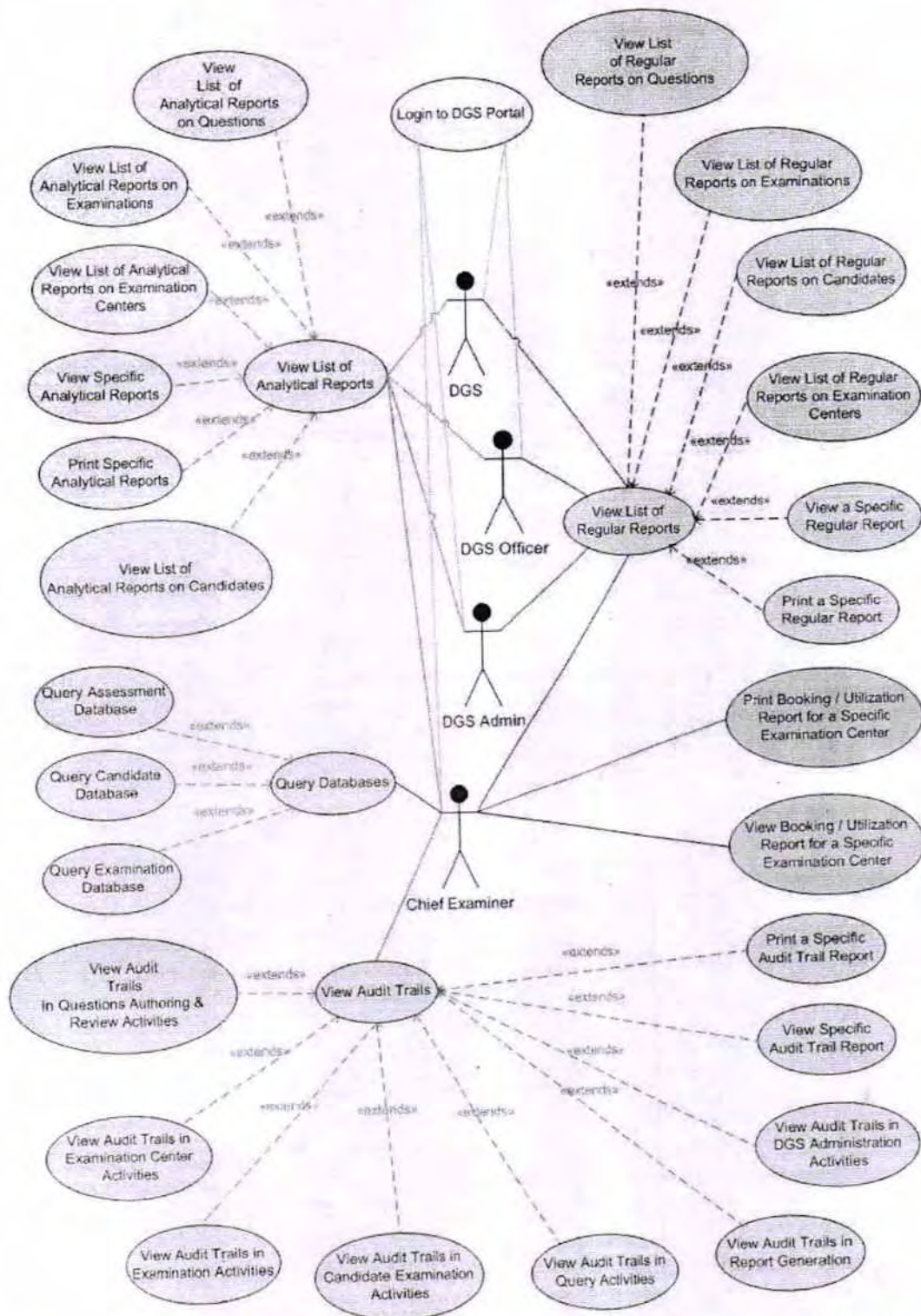


Fig. 3.17: Use Case Diagram of ARAS with Actors DGS, DGS OFFICER, DGS ADMIN & CHIEF EXAMINER

The use case diagram of ARAS with actor System is shown in Figure 3.18.

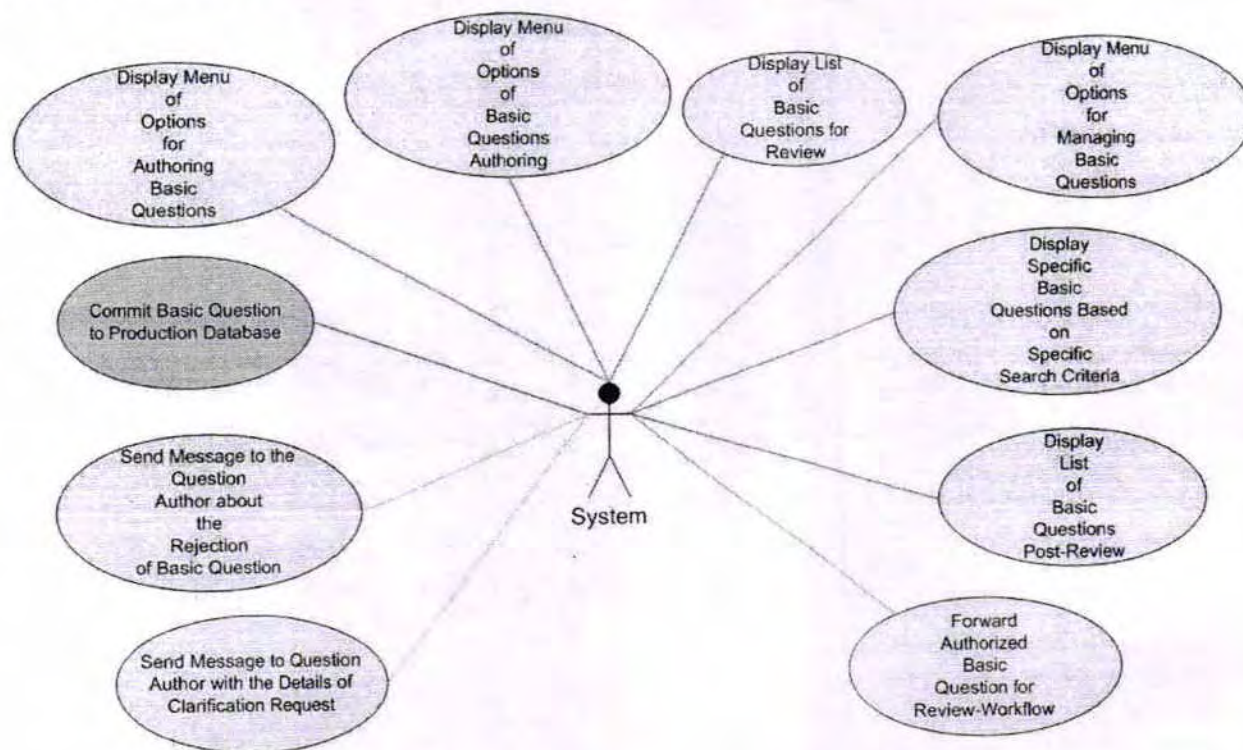


Fig.3.18: Use Case Diagram of ARAS with Actor SYSTEM

3.3 Software Requirements Specifications

The software requirements as derived from the Use Cases listed earlier in the document

4. Change Management Process

This subsection describes the Change Management Process to be used in this project.

1. This document is Version 1.0 of the SRS. This articulates all the software requirements envisaged in the design and development of the computer based assessment system for conducting the examinations of MEO Class IV for DGS.
2. This is the base document submitted to the various stakeholders of the DGS, specifically, the DGS, The Chief Examiner of DGS, the Special Officer of DGS in charge of the project from MMD, Chennai, and the Consultant to DGS from CDAC, Mumbai.
3. The project team from IITB shall present and explain the nature and contents of this SRS Document Version 1.0 with all the stakeholders in (2) above. The project team would also document and share a number of questions that go towards clarifications of the requirements. The stakeholders shall answers these questions.
4. The answers to these questions shall be documented and signed off by DGS and IITB. Thereafter, those relevant parts of the answers, clarifications, etc. would be documented in the next version of the SRS.
5. Each version of the SRS shall be discussed between the project team of IITB and the stakeholders of DGS. The mutually agreed upon version of the SRS shall be signed off by DGS as the most recent at that point in time.
6. The stakeholders at DGS may seek to introduce a fresh requirement, or change an existing requirement. Such a proposal shall be provided in writing through email by the Special Officer of DGS in charge of the project from MMD, Chennai to the Project Manager, IITB.
7. The project team shall examine these change requests (CRs), and provide in writing through email to the Special Officer of DGS in charge of the project from MMD, Chennai (a) agreement to include and adopt the CR in the SRS as-is, or (b) have discussions with the stakeholders of DGS to include and adopt a mutually agreed upon version of the CR in the SRS, or (c) have discussions with the stakeholders of DGS and mutually agree to keep the CR in-hold till a future version, or (d) have discussions with the stakeholders of DGS and mutually agree to drop the CR. All such discussions shall be documented and shared amongst all stakeholders.
8. In the discussions between the project team of IITB and the stakeholders of DGS as in (7) above, it is possible that a consensus may not emerge. In such a case, a resolution shall have to finally emerge after a meeting of all the stakeholders with the Chief Examiner and/or the DGS. The resolved details on the CR shall be incorporated in SRS.

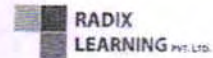


9. The stakeholders of DGS shall refrain from raising CRs after the design document has been submitted to them and sign-off obtained. This is primarily to ensure that the integrity of the architecture and design are not compromised as the requirements evolve and/or change.
10. The stakeholders of DGS shall not raise any CR after the program development has begun in the project. The exceptions to this may arise from those requirements that are incorrectly specified or essential, new requirements that surface. In such a case, the process articulated in (7) shall apply.

5. Document Approvals

During the course of the execution of the project, several documents shall be exchanged between IITB and the DGS that require approval of the DGS and IITB.

1. Documents that are part of the software engineering process shall require approval from the DGS. These are (a) The various versions of the SRS, (b) The various versions of the Design document, (c) Developed applications of the various subsystems, (d) User testing and acceptance. These documents shall be recommended by the Special Officer in charge of the project to the Chief Examiner of DGS for approval. The approval will be accorded on the IITB copy of the document with the signature, name, designation and seal of the Chief Examiner of DGS.
2. Documents pertaining to the creation, review and adoption of questions shall also require approval from the DGS. It should be noted that these Questions are reviewed and approved by a team of Question Reviewers already approved by the DGS. Thus, only a consolidation document will articulate the characteristics of those questions to be recommended by the Special Officer in charge of the project to the Chief Examiner of DGS for approval. The approval will be accorded on the IITB copy of the document with the signature, name, designation and seal of the Chief Examiner of DGS.
3. Documents like invoices shall also require approvals for the process of payment, etc. These documents shall be sent directly to the Chief Examiner of DGS. Internally, the Chief Examiner may verify that the deliverables from IITB at the point in time through the Special Officer in charge of the project. The Chief Examiner shall approve these documents within the structure as mutually agreed upon between DGS and IITB as articulated in the SOW dated 8th July 2010.



6. Supporting Information

A Table of Contents is provided to enable better readability of the SRS.