Request for Proposals (RFP)

The preparation of question bank for IAI's Olympiad to the Institute of Actuaries of India

RFP No. IAI: RFP: 2022-23/MKT/01

Institute of Actuaries of India

Statutory body established under an Act of Parliament

Unit No. F-206, 2nd Floor, F Wing, Tower II, Seawoods Grand Central,
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REQUEST FOR PROPOSAL FOR PREPARATION OF QUESTION BANK FOR IAI'S OLYMPIAD

Date: 29-03-2022

RFP SPECIFIC INFORMATION	
Name of Project:	RFP for **preparation of question bank for IAI's Olympiad**
RFP Reference Number:	IAI:RFP:2022-23/MKT/01
Date of Commencement of Proposal	29-03-2022
Deadline for delivery of Proposal	16-04-2022; 12:00 Hours
Date and Time of Opening of Technical Bids	19-04-2021, 12:00 Hours
Contact person	
Name and Address for Communication	Ms. Rashi Kapoor CHIEF MANAGER- MARKETING & STRATEGY INSTITUTE OF ACTUARIES OF INDIA. Address: Unit no. F-206, 2nd Floor, 'F' Wing in Tower 2, Seawoods Grand Central, Navi Mumbai - 400 706. DIRECT NUMBER- +91 22 62433354 Email : rashi@actuariesindia.org

Schedule for Pre-Bid and Commercial Bid

Sl. No	Description	Details
1	Pre-Bid Query	Pre-bid query shall be only through email latest by 09-04-2022. IAI will respond to these queries by 13-04-2022
2	Applicants should furnish: a) Contact Details- As given above in Name and address for communication b) Hard Copy of the RFP Document and supporting documents duly signed and sealed by the Applicant without quoting rates c) Both commercial and technical bids have to be submitted to the IAI office, Navi Mumbai.	Hard copies should be submitted to Ms. Rashi Kapoor, Chief Manager-Marketing & Strategy at the address for communication mentioned above Signed and sealed RFP document (all pages) along with the supporting documents

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INTRODUCTION
INSTITUTE OF ACTUARIES OF INDIA

IAI is a statutory body established under the Actuaries Act, 2006 which regulates the profession of Actuaries in India. It promotes, upholds, and develops the standard of professional education, training, knowledge, practice, and conduct among the actuaries and actuarial professionals.

One of the main objectives of the IAI is to promote knowledge and awareness about Actuarial Science and its application. As a part of the IAI 2.0 initiative, to reach out to the generation Z, to empower generation Z to take the informed decision about career, to attract bright students to the profession, IAI Council decided has decided to establish Actuarial Science Olympiad.

Actuarial Science provides a framework and techniques to computes the present effects of future contingent events, financial modelling, and risk analysis. Actuarial Science deals with finance, future modelling, and risk. It provides tools and techniques to make decisions in an uncertain environment. It empowers dealing with the future, uncertainty, and risks. In today's fast-changing and fragile environment, actuarial science tools are useful in all walks of life. Actuarial Science tools useful in Insurance, Banking, Finance, Energy, Environment, Social Science, Risk Management, and Governance. Data Science Practices and Tools built on the strong foundation laid by Actuarial Science.

Statistics, Data Science, Commercial Mathematics, Calculus, and Modelling are some of the basic techniques leveraged by Actuarial Science.

IAI is working on establishing Olympiad for Actuarial Science for Indian Students (OASIS). The proposed OASIS will test the theoretical concepts and practical applications to develop critical thinking capabilities among students. Higher Order Thinking Skills (HOTS) are provided 40% weightage in the OASIS test. OASIS aims to

- Encourage and enable statistical and mathematical thinking
- Foster problem solving and decision making
- Focus on Conceptual Learning
- Integrate real data, context, and purpose with the Learning
- Use of technology to explore concepts and analyze data

OBJECTIVE

IAI is inviting authors/writers/ test preparers/ faculty/teachers/experts/firms to develop a question bank for conducting OASIS for classes 9th- 12th based on the CBSE syllabus of Mathematics, Statistics, and Data Science.

The Olympiad is divided into two levels

Level	Class
Pre-OASIS	9th and 10th
OASIS	11th and 12th

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SCOPE OF WORK

1. Develop Question for Pre OASIS and OASIS Test with the following details

Develop Question with the following details for Pre-OASIS- Annexure I	
Name of the Area	Statistics and Data Science, Arithmetic and Financial Mathematics
Name of the Chapter	Chapter Name of 1-17
Name of the Sub-topic	In each chapter
Question- this may also have a named diagram	
Four very close options	(a, b, c, d)
Correct Answer	Option
Marks	1 or 2 or 3
Time Required to solve the question in seconds	In seconds
Solution	Detailed stepwise

Develop Questions with the following details for OASIS- Annexure II	
Name of the Area	Linear Algebra, Calculus & Mathematical Reasoning and Modelling
Name of the Chapter	Chapter Name of 1-14
Name of the Sub-topic	In each chapter
Question- this may also have a named diagram	
Four very close options	(a, b, c, d)
Correct Answer	Option
Marks	1 or 2 or 3
Time Required to solve the question in seconds	In seconds
Solution	Detailed stepwise

2. Quantum / Volume of Question Bank to be delivered
   a. In multiple test units for each chapter consisting of
      - 25 questions of 1 mark
      - 10 questions of 2 marks
      - 5 questions of 3 marks
   b. Minimum one unit to be developed for each proposed chapter.
   c. Up to 5 units may be proposed for each chapter
3. Delivery Schedule- all deliveries to be completed by 30th June 2022
   a. Indicate chapters for which test units will be developed
   b. The number of test units proposed to be developed for each chapter
   c. Schedule of test units to be delivered by end of April, May, and June

Details of Deliverable

1. The applicant should have a mathematics & statistics background, be qualified, and be experienced in teaching or test preparation for standards 9 and 10 for Pre OASIS and standard 11 and 12 for OASIS.
2. Question bank will have 3 types of questions (1 mark, 2 marks & 3 marks varying in difficulty level) from each chapter mentioned in Annexure I and Annexure-II. Stepwise answers are to be provided for all the questions in the sample bank. Time required by an average student must also be indicated for each question.
3. The final questions bank to be submitted in WORD & PDF format.
5. The Applicant will be the one-point of contact to provide a developed question bank to IAI.
6. In case the shortlisted applicant is unable to comply with the timelines and deliver the final product as per the timelines, standard penalties as per Rules shall apply.
7. IAI will get reviewed the question bank submitted from the experts for accuracy, coverage, variety, level of difficulty & time required to solve the problem. Only the questions approved in this review will be considered for payment.
  8. the Last date of receipt of sealed applications is …07-04-2022; 12:00 Hours
…………

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9. No application shall be entertained after the expiry of the due date and time.

PRESENTATION

As a part of the Evaluation of proposals submitted by the applicants, IAI may seek further information or a presentation from the applicant for evaluation purposes. IAI may call for such information/presentation at a short notice online or in person.

AMENDMENT TO RFP / Information from Authors/ Writers/ Test Preparer

At any time prior to the last date for receipt of applications, IAI may for any reason, whether at its own initiative or in response to a clarification requested by a prospective applicant, modify the RFP document by an amendment. In order to provide prospective applicants reasonable time in which to take the amendment into account in preparing their proposals, IAI may at its discretion extend the last date for the receipt of proposals and/or make other changes in the requirements set out in the RFP.

REJECTION OF APPLICATION:

The application is liable to be rejected if:

1. Not in prescribed forms and not containing all required details.
2. Not properly sealed and signed as per requirements.
3. Received after the expiry of the due date and time.
4. Missing of any supporting document(s) with the Proposal.

DISCLAIMER

1. IAI shall not be responsible for any late receipt of applications for any reasons whatsoever. The applications received late will not be considered and returned unopened to the applicant.
2. IAI reserves the right
   a) To reject any/all applications without assigning any reasons thereof.
   b) To relax or waive any of the conditions stipulated in this document as deemed necessary in the best interest of the IAI without assigning any reasons thereof.
   c) To include any other item in the Scope of work at any time after consultation with applicants or otherwise.
   d) IAI reserves the right to accept/ reject any RFP in part or full, without assigning any reason whatsoever.
   e) IAI reserves their right to negotiate the quoted price.
   f) IAI reserves the right to choose more than one applicant and rate as per requirement.

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SUBMISSION OF TECHNICAL BID:
 The technical bid should contain the following details:
- Details & documents of past relevant/similar work undertaken
- A complete list with the educational qualification of the applicant/experts & their highest degree certificates, developing the question bank should accompany the technical bid,
- 03 MCQs (1 mark, 2 marks & 3 marks varying in difficulty level) each for 2 chapters shall be submitted as sample questions by the Applicant
- Quantum / Volume of Test Units proposed to be delivered for each chapter
- Delivery Schedule of each Test Units

SUBMISSION OF FINANCIAL BID:

Sr. No.	Pre-OASIS or OASIS	Area and Chapter Number and Name	Number of Test Units proposed	Delivery date	Basic Rate per Test Units	GST if applicable along with %	Amount including taxes	Amount excluding taxes

SUBMISSION DETAILS
Interested applicant may send the technical and financial bid in two separately sealed envelopes inside a larger sealed envelope super-scribing "Development of Question Bank for IAI Olympiad" to
Chief Manager- Marketing & Strategy, Unit no. F-206, 2nd floor, F Wing in tower 2, Seawoods Grand Central Plot Number R-1 Railway Station, Sector 40, Seawoods, Navi Mumbai, Maharashtra - 400706
For any other queries: Ms. Rashi Kapoor @ rashi@actuariesindia.org

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CONTRACT TERM AND DELIVERY DATES

IAI reserves the right to award under this solicitation without further negotiations. The applicant is encouraged to offer their best terms and prices with the original submission. Final delivery dates will be negotiated upon award.

The selected applicant will be expected to prepare and submit a detailed, comprehensive work plan shortly after being selected and awarded the contract for these services. Please indicate when you would be able to submit such a plan if awarded the contract. The timeframe will be considered in the evaluation of proposals. Given the timeline of the project, please include periodic formal progress check-ins/ status reports between the applicant and IAI team.

No alterations, amendments, omissions, additions, suspensions or variations of the work (hereinafter referred to as variation) under the contract shall be made by the successful Applicant except as directed in writing by IAI. IAI shall have full powers, subject to the provision herein after contained, from time to time during the execution of the contract, by notice in writing to instruct the successful applicant to make any variation without prejudice to the contract.

Applicant shall ensure and certify that deliverables are not plagiarized and applicant is the sole owner of copyright and IP of the Question Bank submitted to the IAI
Applicant agrees that the ownership of Copyright for the Question Bank will be transferred to the IAI. Applicant shall not use these questions thereafter.
All communication, discussions, information shared by the IAI with the applicant is confidential. He shall not share or claim his association or authorship of Question Bank. Applicant shall not disclose such information in its communication or to any third party except to the extent required by law.

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APPLICATION TERMS AND CONDITIONS

1. Interested applicant shall submit their Proposals within the deadline stated above and in compliance with all the terms stated herein. Any proposal received after the prescribed deadline will not be considered.

2. The RFP will also be available on the website https://www.actuariesindia.org during the period mentioned above.

3. Offer Validity Period: The Proposal offer validity shall be 30 days from the date of publication of the RFP. Any offer falling short of the validity period is liable for rejection. IAI may prescribe extension of the bid validity, if found necessary.

4. IAI shall not pay any costs associated with the preparation, visit to IAI office, submittal, or presentation of any proposal.

5. If IAI determines that an applicant has provided, for consideration in the evaluation process or contract negotiations, incorrect information which the Applicant knew or should have known was materially incorrect, that proposal shall be determined non-responsive, and the proposal shall be rejected.

6. IAI reserves the unilateral right to amend this document in writing at any time. IAI also reserves the right to cancel or reissue the document at its sole discretion. If an amendment is issued it shall be provided to all applicants, whose intent to respond to this RFP is known. Applicants shall respond to the final written document and any exhibits, attachments, and amendments.

7. IAI reserves the right, at its sole discretion, to reject any and all proposals or to cancel this RFP in its entirety.

8. IAI reserves the right, at its sole discretion, to waive variances in technical proposals provided such action is in the best interest of IAI. Where IAI waives variances in proposals, such waiver does not modify the RFP requirements or waive the obligations on part of the Applicant from full compliance with the terms contained herein. Notwithstanding any variance, IAI may hold any Applicant to strict compliance with the RFP.

9. All proposals and other materials submitted in response to this RFP become the property of IAI. Selection or rejection of a proposal does not affect this right. All proposal information, including detailed price and cost information, shall be held in confidence during the evaluation process.

10. The comments/amendments/corrigendum to any of the terms and conditions of this RFP Documents issued & circulated to all the applicants as per the conditions set forth in this document should be construed as IAI's final policy and shall supersede all the previous

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written/verbal communications including this RFP Document in that regard, other conditions remaining the same and unchanged.

11. An Applicant who submits or participates in more than one bid will cause all of the proposals in which such applicants who have participated to be disqualified. No Applicant can be a subcontractor while submitting a bid individually in the same bidding process.

12. The proposal transmittal letter (covering letter) must be signed by at least one principal and include all required information.

13. Compliance with RFP terms: Applicant's offer must conform in all respects with the applicable specifications, terms and conditions of the RFP. Any deviation from the RFP specifications or terms and conditions must be clearly and explicitly stated.

14. It is presumed that the Applicants have examined all instructions, forms, terms and specifications in the bidding documents. Failure to furnish all information required by the bid documents or submission of bid not substantially responsive to the bid documents in every respect will be at the Applicant's risk and may result in the rejection of its bid without any clarifications.

15. Canvassing in any form in connection with the RFP is strictly prohibited and the RFPs submitted by the Applicants who resort to canvassing will be liable to be summarily rejected.

16. Sub- Contracting is not permitted.

17. Applicants shall not contact IAI on any matter relating to their application from the time of opening of the Technical Proposal till the contract is awarded. If an applicant wishes to bring additional information to the notice of IAI, it should do so in writing at email address indicated in page 3. Any effort by the applicant to influence IAI in its evaluation, proposal comparison or contract award decisions may result in the rejection of the Applicants proposal.

18. Conflict of Interest –The Applicant appointed as per the procedure, or any person employed by him shall not have any direct or indirect interest, whether pecuniary or otherwise, in any matter concerning or related to the administration or functions of the Institute. Applicants must fully disclose, in writing, to the IAI's RFP contact on or before the closing date of this RFP, any relevant, perceived, or possible conflicts of interest and/or pending lawsuits. The Evaluation Committee shall review any submissions by proponents under this provision and may reject any proposals where, in the opinion of the Evaluation Committee, the Applicant could be in conflict of interest or could be perceived to be in a possible conflict of interest position, if the Applicant were to become a contracting party pursuant to this RFP.

19. If the Applicant fails to deliver the desired number of resources in a timely manner or does not perform any or all the services within the stipulated time schedule, the IAI may, without prejudice to its other remedies under the Contract, and unless otherwise extension of time is agreed upon without the application of Liquidated Damages deduct from the Contract Price,

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as liquidated damages a sum equivalent to 5% of the monthly billing amount for delay of each week or part thereof subject to a maximum of 25% of the total monthly billing in a single instance. Once the maximum deduction is reached, the IAI may consider termination of the Contract. This Liquidated damage will be over and above the penalties as listed elsewhere in the RFP.

20. Taxes and Duties

   (a) The Applicant shall be liable to pay all corporate taxes and income tax that shall be levied according to the laws and regulations applicable from time to time in India.

   (b) Prices quoted should be exclusive of all Central / State Government taxes/duties and levies Any other charges that would be applicable/charged per consignment should be specifically stated /mentioned while submitting the indicative financial bids as required in the format attached in this RFP

   (c) All expenses, stamp duty and other charges/ expenses in connection with the execution of the Agreement as a result of this RFP process shall be borne by the Applicant.

21. The applicants should submit the hard copies of the same along with the Technical RFP. Hard copy of the Technical RFP duly signed and sealed on every page, shall be submitted either in person or by post on the date mentioned above. Hard copies of the supporting documents submitted should be the same. The RFPs should be addressed to the Chief Manager-Marketing & Strategy, Institute of Actuaries of India, Unit no. F-206, 2nd Floor, 'F' Wing in Tower 2, Seawoods Grand Central, Navi Mumbai, Maharashtra-400706.

22. Sealing and Submission of RFPs:
   All the pages, supporting papers/documents submitted along with the RFP should be signed by the authorized signatory and stamped. RFPs not containing full information as regards to qualifying requirements and Technical Bid are liable for rejection.

   In case of hard copies, Applicants are required to submit two separate sealed envelopes, marked as Envelope-1 and Envelope -2 duly labelled viz.,

Envelope-1 should contain: 'Original Technical RFP Document' as downloaded from IAI website along with supporting document with seal and signature on every page.

   This sealed inner envelope shall be wrapped in an outer envelope, properly closed, sealed, addressed to designated officer (as mentioned below), duly super scribing on top –
   (a) the Title of Work
   (b) address of the designated officer (is given below)
   (c) the name and full address of the Applicant along with the contact person and the contact number
   (d) Do Not Open Before – the last date of submission

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Thus, the Envelope 2 will contain the sealed inner envelope.

Each inner envelope should be super-scribed on the top -

(a) The Name and Address of the Applicant
(b) Title of the Work
(c) Documents for Essential Criteria / Original Technical RFP

The address of the designated officer of IAI:

Ms. Rashi Kapoor

Chief Manager- Marketing & Strategy
INSTITUTE OF ACTUARIES OF INDIA,
Unit no. F-206, 2nd Floor, 'F' Wing in Tower , Seawoods Grand Central, Navi Mumbai, Maharashtra
- 400706

RFPs received with defective sealing of outer envelope or inner envelopes will not be accepted.

Note: If the outer cover of any RFP is not addressed to the designated officer mentioned above, such RFPs will be summarily rejected.

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INSTRUCTION TO APPLICANTS- PROPOSAL SUBMISSION

1. **Both Technical Bid and Financial Bid should be submitted together**

2. **Technical Bid:** The applicant should give details of their technical soundness and provide the list of documents. These should be submitted in IAI office, Navi Mumbai duly signed.

3. **Proposal Language:** The Proposal shall be in English Language only.

4. **Deadline for Submission:** The last date of submission of Proposals is given herein, unless amended by IAI through the issuance of addendums on its website.

5. **Extension of Deadline for submission of Proposal:** IAI may, at its discretion, extend this deadline for submission of Proposals by amending the Proposing Documents which will be intimated through IAI website, in which case all rights and obligations of IAI and Proposer will thereafter be subject to the deadline as extended.

6. **Late Proposal:** Proposals received after the scheduled time will not be accepted by IAI under any circumstances. IAI will not be responsible for any delay due to postal service or any other means.

7. **Right to Reject, Accept/Cancel the Proposal:** IAI reserves the right to accept or reject, in full or in part, any or all the proposal offered by applicants without assigning any reason whatsoever. IAI does not bind itself to accept the lowest or any RFP and reserves the right to reject all or any Proposal or cancel the Proposal without assigning any reason whatsoever. IAI also has the right to re-issue the RFP without the applicants having the right to object to such re-issue.

8. **RFP Abandonment:** IAI may at its discretion abandon the process of the selection of Proposer for Appointment of Internal Applicants for IAI at any time before notification of award.

9. **Proposal Evaluation Process:** The Proposal Evaluation will be carried out in 2 stages. Technical Proposal will be first evaluated and commercial bid will be open to only those who qualify the technical bid.

10. **Contacting IAI:** From the time of Proposal opening to the time of Contract award, if any Proposer wishes to contact IAI for seeking any clarification any matter related to the Proposal, it should do so through email communication at rashi@actuariesindia.org

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PROPOSAL EVALUATION METHODOLOGY

IAI will conduct a comprehensive, fair and impartial evaluation of all proposals received in response to this RFP submitted by the submission due date and time specified in this document. Only those proposals will be evaluated which meet the mandatory applicant qualification requirements detailed in this RFP Document.

1. IAI will appoint a Selection Group to evaluate proposals, and to recommend award of a Contract to the successful Applicant, which meets the best interests of the Institute. The judgement of the selection group, considering best interest of IAI will be will be final and binding.

2. Non-responsive proposals will be rejected and not be forwarded to the Selection Group for consideration. Additionally, the Selection Group may determine that documentation proposal is so inadequate that it is non- responsive. Reasons that a proposal may be deemed non-responsive include, but are not limited to:
    *   Failure to sign the proposal
    *   Failure to acknowledge addenda
    *   Failure to provide required documentation
    *   Late submission of a proposal
    *   Respondent does not meet minimum requirements

3. The Selection Group will evaluate all responsive written proposals to determine which proposals best meet the needs of the Institute based on the evaluation criteria.

4. To ensure that all RFP's are fairly evaluated, scored and ranked, it is very important that the RFP's are prepared according to the prescribed format. Failure to follow this requirement may result in the disqualification of a proposal.

ANNEXURE I
DETAILED SYLLABUS FOR PRE-OLYMPIAD

Areas	Chapter with Sub-topics

Statistics and Data Science	1. Managing Data
	    a. Data Handling
	    b. Grouping Data
	    c. Tabulation and Histogram
	    d. Collection and Presentation
	2. Data Visualisation
	    a. Graphical Presentation
	3. Measuring Data
	    a. Frequency Distribution
	    b. Frequency Polygon
	    c. Histogram Vs Bar Chart
	    d. Measuring Central Tendency
	    e. Measuring of Data Dispersion
	    f. Building Z Scores
	4. Experimental Approach to Measure Probability
	    a. Experimental Approach
	    b. Random Experiments
	    c. Sample Space and Events
	    d. Defining Probability

Arithmetic	5. Comparing Quantities 6. Square and Square Roots 7. Cube and Cube Roots 8. Exponents and Powers 9. Direct and Inverse Proportion 10. Factorization
Financial Mathematics	11. Indices and Logs 12. Profit and Loss 13. Compound Interest 14. Banking, and Insurance Computation 15. Installment and EMI 16. GST and Income Tax Computation 17. Share and Dividends

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ANNEXURE-II
DETAILED SYLLABUS FOR OLYMPIAD

Areas	Chapter with Sub-topics
Statistics and Data Science	**1. Relations and Functions** • Sets and their representation. • Union, intersection, and complement of sets and their algebraic properties. • Power-set • Relation, Types of relations, equivalence relations. • Functions; one-one, into and onto functions, the composition of functions **2. Permutation and Combination** • The fundamental principle of counting. • Permutation as an arrangement and combination as a selection. • Meaning of P (n,r) and C (n,r). Simple applications **3. Binomial Theorem** • Binomial theorem for a positive integral index. • General term and middle term. • Properties of Binomial coefficients and simple applications. **4. Conditional Probability** • Probability Distribution • Random Variables • Multiplication of Probability • Bayes Theorem • Bernoulli Trials •

Commercial Mathematics	**5. Functions**
	• Linear Equation of One Variable
	• Linear Equation of Two Variables
	• Quadratic Equation
	   o Quadratic equations in real and complex number system and their solutions.
	   o Relation between roots and coefficients, nature of roots, the formation of quadratic equations with given roots.
	• Polynomials

Linear Algebra	**6. Matrices** • Algebra of matrices, types of matrices, and matrices of order two and three.
	7. Determinants • Properties of determinants, evaluation of determinants, the area of triangles using determinants. • Adjoint and evaluation of inverse of a square matrix using determinants and elementary transformations.

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	• Test of consistency and solution of simultaneous linear equations in two or three variables using determinants and matrices.
	8. Vectors • Scalars and Vectors. Addition, subtraction, multiplication, and division of vectors. • Vector's Components in 2D and 3D space. • Scalar products and vector products, triple product
	9. Linear Programing
Calculus	**10. Measuring Changes** • Straight Lines • Limits and Derivatives
	11. Continuity and Differentiability • Real-valued functions, algebra of functions, polynomials, rational, trigonometric, logarithmic and exponential functions, inverse functions. • Graphs of simple functions. • Limits, continuity, and differentiability. • Differentiation of the sum, difference, product, and quotient of two functions. • Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite, and implicit functions; derivatives of order up to two. • Rolle's and Lagrange's Mean Value Theorems. • Applications of derivatives: Rate of change of quantities, monotonic increasing and decreasing functions, Maxima, and minima of functions of one variable, tangents, and normal.
	12. Integral Calculus • Integral as an anti-derivative. • Fundamental integrals involving algebraic, exponential and logarithmic functions. • Integration by substitution, by parts, and by partial fractions. • Integration using trigonometric identities. • Integral as limit of a sum. • Evaluation of simple integrals • Fundamental Theorem of Calculus. • Properties of definite integrals, evaluation of definite integrals, determining areas of the regions bounded by simple curves in standard form.
	13. Differential Equations • Ordinary differential equations, their order, and degree.

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	• Formation of differential equations.
	• The solution of differential equations by the method of separation of variables.
	• The solution of homogeneous and linear differential equations

Mathematical Reasoning and Modelling	## 14. Reasoning and Modelling
	
	• Statements and logical operations: or, and, implied by, implies, only if and if.
	• Understanding of contradiction, tautology, contrapositive and converse.
	    ○ Arithmetic and Geometric progressions
	    ○ Geometric means between two given numbers.
	
	    a. The relation between A.M. and G.M.