ISTE -SRINIVASA RAMANUJAN MATHEMATICAL COMPETITIONS- 2013 (SRMC-2013)

Instruction Manual

INDIAN SOCIETY FOR TECHNICAL EDUCATION

Shaheed Jeet Sing Marg, near Katwaria Sarai, Neew Delhi 110 016
Tel: 011-2651342, 26963431, Fax: 91-11-26852421
email: istedhq@vanl.net website: www.isteonline.in

INDIAN SOCIETY FOR TECHNICAL EDUCATION

ISTE -SRINIVASA RAMANUJAN MATHEMATICAL COMPETITIONS- 2013 (SRMC-2013)

Indian Society for Technical Education has successfully completed the Srinivasa Ramanujan Mathematical competitions – 2012 and paid tribute to the great son of India from Tamilnadu 'Srinivasa Ramanujan' during his 125 birth anniversary with the support of the National Board of Higher Mathematics (NBHM) and Institute of Mathematical Sciences, Madras.

NBHM was kind enough to accord approval to conduct the competitions in the same manner with more participation from students and teachers this year also. ISTE will utilize this opportunity and conduct the same in an appropriate manner. We solicit the support of all ISTE Chapters and institutions as well.

Details regarding the competitions may be obtained from ISTE Chapter Chairman of the College. The application form and general guidelines are also made available in our website www.isteonline.in. For more details you may contact us at istedhq@vsnl.net

TAKE PART IN THE COMPETETION AND WIN PRIZES

ISTE -Srinivasa Ramanujan Mathematical Competitions

General Guidelines

1. General Information

- Section Chairman will be the Coordinator for the particular Section for the Project
- There will be one examination on the same day for Students of Polytechnic and Engineering Colleges
- There will be one examination on the same day for Teachers of Polytechnic and Engineering Colleges
- There will be four different Question Papers one each for different category for Stage I (Chapter level)
- The examination will be only Multiple Choice Questions (MCQ) type with duration of two hours for the Chapter level.
- There will be a separate application format for Students and Teachers
- Application forms can be downloaded from ISTE website www.isteonline.in
- Filled in application will be received by the Chapter Coordinator

2. Students Awards

A. Chapter Level

- Each students chapter will conduct exam at the chapter level and select a maximum of **FIVE** and a minimum of **ONE** student based on the ranks to the next level.

B. Zonal Level

- There will be a total of 38 zones for the Degree level and 23 zones for the diploma level.
- Three students from each stream (Degree and Diploma) will be selected from each zone. (3 Degree + 3 Diploma from one Section)
- Section Chairman will conduct the exam in the respective zones within the Section and select the students with the help of Zonal Coordinator
- Three prizes in each stream (Diploma and Degree) for students will be given for each Section at a special function organized at the Zonal level.

C. National Level

- The selected candidates from the zonal level will be qualified to take the national level examination.

- National level examination will be conducted at common centers for degree and diploma stream.
- Five students from degree level and five students from diploma level will be selected and awarded suitably.
- Five consolation prizes will be given to degree and diploma level students apart from the first five prize winners
- Certificates will be given to all the participants.

3. Teachers Awards

A. Chapter Level

- Each faculty chapter will conduct exam at the chapter level and select a maximum of **FIVE** and a minimum of **ONE** teacher based on the ranks to the next level.

B. Zonal Level

- There will be a total of 38 zones for the Degree level and 23 zones for the diploma level.
- Three teachers from each stream (Degree and Diploma) will be selected from each zone (3 Degree + 3 Diploma from one Section)
- Section Chairman will conduct the exam in the respective zones and select the teachers with the help of Zonal Coordinator
- Three prizes in each stream (Diploma and Degree) for teachers will be given for each zone at a special function organized at the Zonal level.

C. National Level

- The selected candidates from the zonal level will be qualified to take the national level examination.
- Five teachers from degree level and five teachers from diploma level will be selected and awarded suitably.
- Five consolation prizes will be given to degree and diploma level teachers apart from the first five prize winners
- Certificates will be given to all the participants.

4. Responsibilities of the Chapter Coordinator:

- ISTE Chapter Chairman will be the Chapter Coordinator for this project
- He will invite application from Students and Teachers
- He will compile the list of eligible candidates and send soft and hard copies to Section Chairman and ISTE New Delhi

- Collect an amount of Rs. 100/- from each candidate (Students and Teachers) and send a consolidated DD drawn in favour of "ISTE New Delhi' payable at New Delhi along with the list of registered candidates.
- Send the Hall ticket informing the date, exam centre and time with instructions to candidates.
- Conduct the exam on the stipulated dates
- Question papers will be sent by ISTE New Delhi
- Evaluate the answers based on the keys provided by ISTE-NBHM and send the rank list to ISTE NEW DELHI
- Send the certified expenses and statement of accounts to ISTE NEW DELHI within 10 days after the completion of exams

5. Responsibilities of the Section Coordinator:

- Give wide publicity to the project in all the institution through available methods
- Coordinate the activities with the Chapter Chairmen
- Compile the list of eligible candidates sent by Chapter Chairman and send to ISTE New Delhi.
- Supervise the conduct of the exams on the stipulated dates by chapters
- Coordinate with the Chapters to send the certified expenses and statement of accounts to ISTE New Delhi within 10 days after the completion of exams

6. Calendar of Events:

- Announcement in the website for downloading: 01 July 2013
- Last date of sending list of registered applicants to ISTE, ND by ISTE Chapters: 26 th August 2013
- Dispatch of CL-Question paper booklet to ISTE Chapters: 29 August 2013
- Date of Chapter Level Examination: 30 August 2013
- Last date of sending Rank list to ISTE, ND by Chapters: 16 September 2013
- Publication of List of candidates appearing for Zonal level Exam: 24 September 2013
- Dispatch of Question paper to Zonal Centers: 08 November 2013
- Date of Zonal Level Examination: 09 November 2013
- Late date of sending ZL-Answer Papers to Evaluation Center: 20 November 2013
- Publication of Result of the Zonal level Exam: 09 December 2013

- Dispatch of National Level Question paper to National Centers: 24 January 2014
- Date of National Level Examination: 25 January 2014
- Late date of sending NL-Answer Papers to Evaluation Center: 14 February 2014
- Announcement of winners: 28 February 2014
- Prize distribution function March 2014

7. Prize Money

National Level

- First prize in each category : Rs. 30,000
- Second prize in each category: Rs. 25,000
- Third prize in each category: Rs. 20,000
- Fourth prize in each category: Rs. 15,000
- Fifth prize in each category: Rs. 10,000
- Consolation prize in each category: Rs. 5,000
- Prize winners will be given certificate, medallion and cash prize.

Zonal Level

- First prize in each category: Rs. 3,000
- Second prize in each category: Rs. 2,000
- Third prize in each category: Rs. 1,000
- Prize winners will be given certificate and cash prize.

Chapter Level

- Certificate of participation will be given to all the participants

8. Finance

The guidelines for expenditure like remuneration to the coordinator, supervisors, assistants, travel allowances and other misc expense is attached at the annexure.

INDIAN SOCIETY FOR TECHNICAL EDUCATION

SRINIVASA RAMANUJAN MATHEMATICS COMPETITION-2013 EXAMINATION

Examination General Instructions for Section Chairman

1. Question papers in pdf format will be sent to you on or before 29 th August 2013 through e-mail.
2. There will be FOUR sets of each category of question papers for Teachers and Students namely Type A,B,C and D.
3. There are two zipped files, each of them is protected by password.
4. The passwords will be sent to you separately on 30 th August 2013 before 10 am to your email and in your mobile by sms.
5. The following instructions are to be given to the Chapter Chairman by you for the smooth conduct of the examination.
   - To issue Hall tickets to the eligible candidates (Teachers and Students)
   - To take sufficient number of question papers and response sheets as per
   - the requirement.
   - Question papers are to be distributed in manner such that candidates gets
   - in the order A,B,C, D.
   - No two adjacent candidates should get the same Type and seating
   - arrangements should be done accordingly.
   - To inform the candidate to write the relevant question paper Type in the
   - response sheet.
   - To inform the candidate to return the question paper along with the
   - marked response sheet.
6. For Chapter level (level- I) evaluation to be done by the Chapter Chairman in his centre and merit list to be sent to ISTE, New Delhi. (see instructions for the chapter level evaluation)

INDIAN SOCIETY FOR TECHNICAL EDUCATION

SRINIVASA RAMANUJAN MATHEMATICS

COMPETITION-2013 EXAMINATION

General Instructions for Chapter Level Evaluation

1. For evaluating the response sheets for the chapter level, answer keys will be sent to the Section Chairman by email on 03 September 2013.
2. Section Chairmen are requested to send the answer keys to the respective Chapter Chairman.
3. The Chapter Chairman shall appoint examiners from the Department of Mathematics of his college for the evaluation of the response sheets.
4. The remuneration for evaluating response sheets has been fixed as Rs. 15/- per response sheet
5. The Chapter Chairman should send the following to the ISTE HQ, New Delhi on or before: 16 September 2013
    - Application forms registered (teachers and Students) with details
    - Attendance sheet
    - Used Question papers
    - Corrected Response sheets
    - Total registration fee collected from teachers and students in a single DD drawn in favour of "ISTE New Delhi"
    - Merit list (1 to 5) for both teachers and students with contact details.
    - Statement of expenditure and remuneration claim

Indian Society for Technical Education

Srinivasa Ramanujan Mathematics

Competitions Examination - 2013

Teacher's Application Form

Name of the Candidate :

Father's Name :

Mother's Name :

Date of Birth (attach proof) :

Sex : Male/Female

Place of Birth :
(write Taluk, District and State)

Mother tongue :

Nationality/Religion :

Category (General/BC/OBC/SC/ST) :

College in which you are studying :
(give full address)

Pin Tel:

Qualification:

No. of year of experiences:

Postal Address (all correspondence will be sent to this address, the same should be entered in the **HT** also)

Phone Nos. Landline (with code):

Mobile:

E-mail ID

Demand Draft details (A/C Payee only) DD No.:_____Date _____

Drawn in favour of "ISTE" Drawn on Bank_____

Amount: Rs.100/-

Payable at: **New Delhi**

Any other remarks you wish to make

The above statement made by me is true to the best of my knowledge, information and belief.

(Signature of the applicant with date)

Send the filled in application form along with the demand draft to the ISTE Chapter Chairman of your institution.

ISTE – SRINIVASA RAMANUJAM MATHEMATICS AWARD COMPETITIONS EXAMINATION – 2013

HALL TICKET

Name of the Candidate:

Registration No. :
(To be allotted by Office)

Address of the Centre :

Place:

Date: **Authorized Signatory**

Indian Society for Technical Education

Srinivasa Ramanujan Mathematics Competitions Examination - 2013

Student's Application Form

Name of the Candidate :

Father's Name :

Mother's Name :

Date of Birth (attach proof) :

Sex : Male/Female

Place of Birth :
(write Taluk, District and State)

Mother tongue :

Nationality/Religion :

Category (General/BC/OBC/SC/ST) :

College in which you are studying :
(give full address)

Pin Tel:

Course of Study: Branch :

Year of study 1/2/3/4

Postal Address (all correspondence will be sent to this address, the same should be entered in the **HT** also)

Permanent Address :

Phone Nos: Landline (with code):

Mobile:

E-mail ID

Demand Draft details (A/C Payee only) DD No.:_____Date _____

Drawn in favour of "ISTE" Drawn on Bank_____

Amount: Rs.100/-

Payable at: **New Delhi**

Any other remarks you wish to make

The above statement made by me is true to the best of my knowledge, information and belief.

(Signature of the applicant with date)

Send the filled in application form along with the demand draft to the ISTE Chapter Chairman of your Institution.

ISTE – SRINIVASA RAMANUJAM MATHEMATICS COMPETITIONS EXAMINATION – 2013

HALL TICKET

Name of the Candidate :

Registration No. :
(To be allotted by Office)

Address of the Centre :

Place:

Date: **Authorized Signatory**

INDIAN SOCIETY FOR TECHNICAL EDUCATION

SRINIVASA RAMANUJAN MATHEMATICS COMPETITION-2013 EXAMINATION

Exam Center:

Date:

Attendance Sheet

S.No	Hall Ticket No	Name	Mobile	Signature

Indian Society for Technical Education, New Delhi

Address Format

Name of the Institution	
Address	
ISTE Student Chapter Number	
ISTE Faculty Chapter Number	
Institutional Membership Number	
Name of the Principal	
Telephone	
Mobile	
email	
Fax	
Name of the Chapter Chairman	
Telephone	
Mobile	
email	
Name of the Chapter Secretary	
Telephone	
Mobile	
email	

Place:
Date:

INDIAN SOCIETY FOR TECHNICAL EDUCATION

ISTE-SRMC 2013

Remuneration Details for an Exam Center

Co-ordinator (1): Principal/ISTE Chapter Chairman	Rs. 500 per session
Supervisor (Invigilator)(1):	Rs. 300 per session
Office Staff (1):	Rs. 150 per session
Assistant/Waterman (1):	Rs. 100 per day
Security:	Rs. 100 per day

*(For 50 candidates or part thereof; more than 50, more supervisors be engaged)

INDIAN SOCIETY FOR TECHNICAL EDUCATION

SRINIVASA RAMANUJAN MATHEMATICS COMPETITION EXAMINATION-2013

Name of the candidate:

Hall Ticket Number:

Date: **Time:**

Centre Code / Name:

Level of Examination :(Chapter /Zonal/National):

(For office use)

Signature:

Name of the Examiner: (CAPITAL LETTERS)

INDIAN SOCIETY FOR TECHNICAL EDUCATION
Srinivasa Ramanujan Mathematics Competition-2013 Examination

Maximum: 40 Marks **Response Sheet** **30 Aug 2013**

Call Letter No._____ **Instructions** **Time: 2.00 to 4.00 p.m.**

No cell phones, or electronic devices will be allowed during the examination. This question book contains 40 questions. Each question carries 1 mark.

1. Please read the instructions first; and **do not open** the question book until you are instructed do so.
2. You may take first 5 minutes to look for any defects (such as missing a page, printing defects, etc.) in the question book. Any such defects should be brought to the attention of the invigilator within first five minutes.
3. Please enter your Hall ticket number on your question book and response sheet in the space provided. **Please write the question paper type A or B or C or D in the response sheet.**
4. Do not write anything on the question book. **Answers must be circled only on the Response sheet.**
5. You may not leave the exam Hall within the first half hour of the examination.
6. Every question has four possible responses. You have to select the most accurate one and circle your answer on your response sheet.
7. **Make sure that your responses are clearly circled**. Avoid errors or changes on the response sheet.
8. **At the end of the two hours you must leave your question book, the response sheet and the blank sheets on your table with face down. You should not take any part of this examination with you.**
9. Announcement of time will be made every 15 minutes and also 5 minutes before the end of two hours.
10. **If you are found cheating on this examination, you will be disqualified for the competition.**

INDIAN SOCIETY FOR TECHNICAL EDUCATION
Srinivasa Ramanujan Mathematics Competition-2013 Examination
Maximum Marks: 40. Response Sheet 30 Aug 2013 : 2.00 to 4 p.m.

Call Letter No.———————— Question Paper Type: ☐

(1)	**A**	**B**	**C**	**D**	(21)	**A**	**B**	**C**	**D**
(2)	**A**	**B**	**C**	**D**	(22)	**A**	**B**	**C**	**D**
(3)	**A**	**B**	**C**	**D**	(23)	**A**	**B**	**C**	**D**
(4)	**A**	**B**	**C**	**D**	(24)	**A**	**B**	**C**	**D**
(5)	**A**	**B**	**C**	**D**	(25)	**A**	**B**	**C**	**D**
(6)	**A**	**B**	**C**	**D**	(26)	**A**	**B**	**C**	**D**
(7)	**A**	**B**	**C**	**D**	(27)	**A**	**B**	**C**	**D**
(8)	**A**	**B**	**C**	**D**	(28)	**A**	**B**	**C**	**D**
(9)	**A**	**B**	**C**	**D**	(29)	**A**	**B**	**C**	**D**
(10)	**A**	**B**	**C**	**D**	(30)	**A**	**B**	**C**	**D**
(11)	**A**	**B**	**C**	**D**	(31)	**A**	**B**	**C**	**D**
(12)	**A**	**B**	**C**	**D**	(32)	**A**	**B**	**C**	**D**
(13)	**A**	**B**	**C**	**D**	(33)	**A**	**B**	**C**	**D**
(14)	**A**	**B**	**C**	**D**	(34)	**A**	**B**	**C**	**D**
(15)	**A**	**B**	**C**	**D**	(35)	**A**	**B**	**C**	**D**
(16)	**A**	**B**	**C**	**D**	(36)	**A**	**B**	**C**	**D**
(17)	**A**	**B**	**C**	**D**	(37)	**A**	**B**	**C**	**D**
(18)	**A**	**B**	**C**	**D**	(38)	**A**	**B**	**C**	**D**
(19)	**A**	**B**	**C**	**D**	(39)	**A**	**B**	**C**	**D**
(20)	**A**	**B**	**C**	**D**	(40)	**A**	**B**	**C**	**D**

Indian Society for Technical Education

Srinivasa Ramanujan Mathematical Competitions- 2013

Syllabus

Polytechnic Colleges

Basics:

Sets and functions-injective and surjective functions (1-1 and onto function)-composition of functions- simple counting and equivalence of sets- finite and infinite sets-knowledge of polynomial functions- rational functions-exponential function-logarithmic function-trigonometric functions-DeMoivre's theorem-inverse trigonometric functions- Real and complex numbers (basic understanding) _ Simple Combinatoric problems-simple probability problems

Algebra

Algebra of complex numbers–Real and Imaginary parts- Polar form of complex number – Modulus and amplitude form multiplication and division of complex numbers in polar form- Argand plane–collinear points, four points forming square, rectangle, rhombus. Demoivre's Theorem related Problems - Finding the nth roots of unity .

Quadratic equations- polynomials- relation between roots and coefficients-Remainder theorem- factorization-real roots and complex roots.
Determinants: Definition and expansion of determinants of order 2 and 3 - Properties of determinants .Cramer's rule to solve simultaneous equations in 2 and 3 unknowns-. Problems involving properties of determinants - Matrices :Definition of matrix - Types of matrices - Algebra of matrices such as equality, addition, subtraction, scalar multiplication and multiplication of matrices- Transpose of a matrix-adjoint matrix and inverse matrix-. permutation and combination- Binomial theorem for positive integral index (statement only), finding of general and middle terms - Problems finding co-efficient of , independent terms. . Binomial Theorem for rational index, expansions- Simple Expansions - Partial Fractions - To resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear

factors and irreducible non repeated quadratic factors-.

Geometry

Length of perpendicular distance from a point to the line and perpendicular distance between parallel lines- -Angle between two straight lines and condition for parallel and perpendicular lines- Pair of straight lines - angle between pair of straight lines. Condition for parallel and perpendicular lines - Condition for general equation of the second degree $+ \quad + 2h \quad + 2 \quad + 2 \quad + \quad = 0$ to represent pair of lines - Angle between them - condition for parallel and perpendicular lines.

CIRCLES

Equation of circle – given centre and radius. General Equation of circle – finding center and radius- Equation of circle through three non collinear points – concyclic points- Equation of circle on the line joining the points , and points , as diameter- Length of the tangent-Position of a point with respect to a circle- Equation of tangent -Concentric circles – contact of circles (internal and external circles) – orthogonal circles – condition for orthogonal circles

Trigonometry

Trigonometrical ratio of allied angles-Expansion of Sin(A+B) and cos(A+B)- problems using above expansion - Expansion of tan(A+B) - Trigonometrical ratios of multiple angles and sub-multiple angles- Sum and Product formulae-Definition of inverse trigonometric ratios- relation between inverse trigonometric ratios.

Calculus:

Differential Calculus:

Limits- continuous functions- intermediate value theorem -differentiable functions- derivatives of sum, difference, product and quotient of two differentiable functions- derivatives of elementary functions – second derivative and higher order derivative- successive differentiation- derivatives of standard functions.

Derivative as a rate measure- Velocity and Acceleration- Tangents and Normals- Increasing function- Decreasing function and turning points -Maxima and Minima (for single variable only). Partial Differentiation- Partial differentiation of two variable up to second order only- Definition of Homogeneous functions- Euler's theorem.

Integral Calculus:

Standard integrals- integration of rational functions- integration by parts- definite integrals and their simple properties- Area –volume – volume of cone and sphere.

Ordinary Differential Equations:

Definition of order and degree of differential equation – solution of first order variable separable type differential equation - Solution of first order linear differential equation - Solution of second order differential equations with constant coefficients

VECTOR ALGEBRA

Vectors – types, addition and subtraction of vectors- Properties, of addition and subtraction, position vector-Resolution of vector in two and three dimensions- Direction cosines, direction ratios- Definition of scalar product of two vectors – Properties – Angle between two vectors - Geometrical meaning of scalar Product. Work done by Force. Definition of vector product of two vectors-Geometrical meaning- properties-angle between two vectors–unit vector perpendicular to two vectors- Definition of moment of a force - scalar triple product - geometrical meaning – coplanar vectors - Vector Triple Product - Scalar and Vector product of four vectors.

PROBABLITY DISTRIBTION

Definition of Random Variable – Type –Probability Mass Function – Probability density function -Mathematical expectation of discrete variable, mean and variance – Binomial distribution - Expressions for mean and variance. Poisson distribution- Expression for mean and Variance - Normal distribution - standard normal distribution- Constants of normal distribution (results only) – Properties of normal distribution

Curve Fitting

Fitting of a straight line using least square method.

Indian Society for Technical Education

Srinivasa Ramanujan Mathematical Competitions- 2013

Syllabus

Engineering Colleges

Basics:

Sets and functions-injective and surjective functions (1-1 and onto function)-composition of functions- simple counting and equivalence of sets- finite and infinite sets-knowledge of polynomial functions- rational functions-exponential function-logarithmic function-trigonometric functions-DeMoivre's theorem-inverse trigonometric functions- hyperbolic functions and inverse hyperbolic functions. Real and complex numbers (basic understanding) _ Simple Combinatoric problems-simple probability problems

Algebra:

Quadratic equations- polynomials- relation between roots and coefficients-Remainder theorem- factorization-real roots and complex roots.

Matrices- algebra of matrices- determinants- inverse of a matrix- row vectors and column vectors-linear dependence and linear independence- span of vectors- basis –rank and consistency of linear systems-characteristic equation-eigen values-eigen vectors- Cayley Hamilton theorem- symmetric matrices-orthogonal matrices-Hermitian matrices- diagonal matrices and diagonalization.

Geometry

Triangles and their basic properties-Polygons-circles- simple mensuration formulae-conics and their shapes.

Coordinate Geometry

Two dimensional coordinate geometry:

Rectangular coordinates-points and distance between points-point dividing a line segment in a given ratio- equations of curves- straight lines- slope of a straight line- various standard equations of straight lines- circles- tangent and normal- standard equations of conics-eccentricity of a conic- tangent and normal of a conic-asymptotes.

Three dimensional coordinate geometry:

Straight lines-skew lines-sphere-plane section of a sphere-tangent plane-equation of a cone-right circular cone-cylinder – right circular cylinder.

Convergence:

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms – Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

Calculus:

Differential Calculus:

Limits- continuous functions- intermediate value theorem -differentiable functions- derivatives of sum, difference, product and quotient of two differentiable functions- derivatives of elementary functions – second derivative and higher order derivative- successive differentiation- derivatives of standard functions.

Derivative as a rate of change- simple applications-

Roll's Theorem- Mean Value Theorem

Maxima and minima using calculus

Taylor series- Maclaurin series- binomial series-exponential series-logarithmic series .

Tangent and normal of differentiable curves- increasing and decreasing functions- curvature in Cartesian coordinates- center and radius of curvature-evolutes and involutes- envelopes.

Functions of several variables-partial derivatives-Euler's theorem on homogeneous functions-total derivatives-jacobians-maxima and minima of functions two/three variables- Lagrange multipliers.

Integral Calculus:

Standard integrals- integration of rational functions- integration by parts-definite integrals and their simple properties-area length, surface area and volume of revolution – improper integrals- beta gamma functions

Double and triple integration – Cartesian and polar coordinates- change of order of integration- change of variables Cartesian to polar coordinates- Area as a double integral and volume as a triple integral.

Ordinary Differential Equations:

Linear ordinary differential equations of first order, second order and higher order equations with constant coefficients – variation of parameters- System of first order linear equations with constant coefficients

Laplace Transforms:

Laplace transform – Conditions for existence – Transform of elementary functions –Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.
Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

Complex Variables:

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy –Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.
Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues– Residue theorem – Application of residue theorem to evaluate real integrals .

Vector Calculus :

Vector algebra – vector equations of straight lines and planes-Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

Fourier Series:

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series –Half range cosine series – Complex form of Fourier series – Parseval's identity .

Fourier Transforms:

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms –Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

Partial Differential Equations:

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant

coefficients. Solutions of one dimensional wave equation – One dimensional equation of heat conduction –Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) –Fourier series solutions in Cartesian coordinates.

Transforms and Difference equations:

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem - Formation of
difference equations – Solution of difference equations using Z-transform.

Probability, Statistics and Numerical Methods:

Discrete and continuous random variables – Moments - Moment generating functions and their properties. Binomial, Poisson ,Geometric, Uniform, Exponential, Gamma and normal distributions – Function of Random Variable.

Sampling distributions - Tests for single mean, Proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.
Completely randomized design – Randomized block design – Latin square design -factorial design.
Newton-Raphson method- Gauss Elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method .
Lagrange's and Newton's divided difference interpolation –Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal and Simpson's 1/3 rules.
Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Milne's predictor-corrector methods for solving first order equations - Finite difference methods for solving second order equation.