Annexure No.	18 A
SCAA Dated	29.02.2008

BHARATHIAR UNIVERSITY :: COIMBATORE – 641 046

REGULATIONS FOR B. Sc. MATHEMATICS DEGREE COURSE
Semester System
(with effect from 2007-2008)

1. **Eligibility for Admission to the Course**

Candidate for admission to the first year of the **B. Sc. Mathematics** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu with Mathematics as one of papers only eligible or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor. Business Mathematics, General Mathematics and Statistics subject at HSC can **not be considered** as equivalent to Mathematics.

2. **Duration of the Course**

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**

The course of study for the UG degree course shall consist of the following

a) Part - I

Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu. It shall be offered during the first four semesters with one examination at the end of each semester.

b) Part – II : English

The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester Part II English will be offered as communication skills.

c) Foundation Course

The Foundation course shall comprise of two stages as follows:
Foundation Course A : General Awareness (I & II semesters)
Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

From the printed material supplied by the University - 75%
Current affairs & who is who? - 25%

The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

Group A : Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

Group B: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

Group C: application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

Group D: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

Diploma Programme:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student's performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).

(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) a candidate will be permitted to appear for the university examinations for any semester if

i) He/she secures not less than 75% of attendance in the number of working days during the semester.

ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65%of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) "Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.

6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**

11. **Conferment of the Degree**

No candidate shall be eligible for conferment of the Degree unless he / she,

i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.

ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.

iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be [permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

14. **Evening College**

The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**

The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**

The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**

Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.

BHARATHIAR UNIVERSITY::COIMBATORE-641 046
Group A: B. Sc. (MATHEMATICS) WITH COMPULSORY DIPLOMA IN OPERATION RESEARCH
(For the students admitted from the academic year 2007-2008 and onwards)
Scheme of Examination

First Year

Semester	Part	Subject and Paper	Instruction hour/week	University Examination	
				Duration In Hrs	Max. Marks
I	I	Language-I - Paper-I	6	3	100
	II	English - Paper-I	6	3	100
	III	Gr.A Core-Paper I - Classical Algebra	4	3	100
		Gr.A Core-Paper II-Calculus	5	3	100
		Gr.B Allied A - Paper I Chosen by the college	7	3	100
		Foundation Course A	2	-	-
II	I	Language-I-Paper-II	6	3	100
	II	English - Paper-II	6	3	100
	III	Gr.A Core-Paper III Analytical Geometry	4	3	100
		Gr.A Core-Paper IV- Trigonometry, Vector Calculus and Fourier Series	5	3	100
		Gr.A Allied - Paper II Chosen by the college	7	3	100
		Foundation Course A	2	3	100

Second Year

III	I	Language-I - Paper-III	6	3	100
	II	English- Paper-III	6	3	100
	III	Gr.A Core-Paper V- Differential Equations and Laplace Transforms	3	3	100
		Gr.A Core-Paper VI-Statics	3	3	100
		Gr.B Allied B - Paper I Chosen by the college	7	3	75
		Foundation Course B	2	-	-
		Diploma in Operations Research - Paper-I	3	3	100

Semester	Part	Subject and Paper	Instruction hour/week	University Examination	
				Duration In Hrs	Max. Marks
IV	I	Language-I- Paper -IV	6	3	100
	II	English - Paper -IV	6	3	100
	III	Gr.A Core-Paper VII-Dynamics	3	3	100
		Gr.A Core-Paper VIII-Programming in C	3	3	100 *
		Gr.B Allied B - Paper II – Chosen by the college	5	3	75
		Practicals (Allied)	2	3	50
		Foundation Course B	2	3	100
		Diploma in Operations Research – Paper II	3	3	100

Third Year

V	III	Gr.A Core- Paper IX-Real Analysis-I	5	3	100
		Gr.A Core-Paper X-Complex Analysis-I	6	3	100
		Gr.A Core - Paper XI-Modern Algebra-I	6	3	100
		Gr.C- Appl. Ori.Sub. A-Paper-I	5	3	100
		Gr.C- Appl. Ori.Sub. A-Paper-II	5	3	100
		Diploma in Operations Research Paper III	3	3	100
VI	III	Gr.A Core Paper XII Real Analysis-II	5	3	100
		Gr.A Core-Paper XIII Complex Analysis-II	6	3	100
		Gr.A Core- Paper XIV Modern Algebra-II	6	3	100
		Gr.C- Appl. Ori. Sub. B-Paper-I	5	3	100
		Gr.C- Appl. Ori. Sub. B- Paper - II	5	3	100
		Diploma in Operations Research - Project	3	3	100

*** - All Computer papers have Theory and Practical examinations : Theory - 75 marks; Practical - 25 marks**

Application Oriented Subjects

Semester V	**Semester V I**
Gr.C.Appl. Ori. Sub. A Paper I & II	**Gr.C.Appl. Ori. Sub. A Paper I & II**
Astronomy- I	Astronomy- II
Numerical Methods-I	Numerical Methods-II
Discrete Maths	Automata Theory & Formal Languages
Graph Theory	Programmin in C++.
RDBMS & Oracle.	Internet and Java Programming.

Note:-In case the computer subjects are chosen as AOS paper , practical exams should be conducted and the marks for the papers should be split into

Written Exam	- 75	100
Practical Exam	- 25	

Any two subjects from the following

Allied subjects

1.Physics
2.Chemistry
3.Accountancy
4.Statistics.

Semester: I - Core Paper- I

Subject title: Classical Algebra **Credit hours-4**

Subject description: This course focuses on the convergence and divergence of different types of series, also discusses the standard methods of solving both polynomial and transcendental type equations.

Goal: To enable the students to learn about the convergence and divergence of the series and to find the roots for the different types of the equation.

Objectives: On successful completion of this course the students should gain knowledge about the convergence of series and solving equations.

UNIT I:

Binomial, exponential theorems-their statements and proofs- their immediate application to summation and approximation only.

UNIT II:

Logarithmic series theorem-statement and proof-immediate application to summation and approximation only. Convergency and divergency of series –definitions, elementary results-comparison tests-De Alemberts and Cauchy's tests.

UNIT III:

Absolute convergence-series of positive terms-Cauchy's condensation test-Raabe's test.

UNIT: IV

Theory of equations: Roots of an equation- Relations connecting the roots and coefficients-transformations of equations-character and position of roots-Descarte's rule of signs-symmetric function of roots-Reciprocal equations.

UNIT V:

Multiple roots-Rolle's theorem - position of real roots of f(x) =0 - Newton's method of approximation to a root - Horner's method.

Treatment as in

Algebra-T.K .Manicavachasam Pillai, T.Natarajan, K-S Canapathy.
S. Viswanatham (Printers & Publishers Private Ltd-2006)

Reference:

1. Mathematics for B.Sc. Branch I -Vol. I- P. Kandasamy and K. Thilagavathy
(For B.Sc-I semester) S. Chand and Company Ltd, New Delhi, 2004.
2. Algebra. -- N.P.Bali- Laxmi publications

Core Paper- II

Subject title: CALCULUS **Credit hours-5**

Subject description:

This course presents the idea of curvatures, integration of different types of functions, its geometrical applications, double, triple integrals and improper integrals.

Goal:

To enable the students to learn and gain knowledge about curvatures, integrations and its geometrical applications.

Objectives:

On successful completion of course the students should have gain about the evolutes and envelopes, different types of integrations, its geometrical application, proper and improper integration.

UNIT I:

Curvature-radius of curvature in Cartesian and polar forms-evolutes and envelopes- pedal equations- total differentiation- Euler's theorem on homogeneous functions.

UNIT II:

Integration of f'(x)/f(x), f'(x)√f(x) ,(px+q)/√(ax^2+bx+c)], [√(x-a)/(b-x)],
[√(x-a)(b-x),1/[√(x-a)(b-x),1/(acosx+bsinx+c),
1/(acos^{2}x+bsin^{2}x+c),Integration by parts

UNIT III:

Reduction formulae- problems- evaluation of double and triple integrals- applications to calculations of areas and volumes-areas in polar coordinates.

UNIT IV:

Change of order of integration in double integral- Jacobions.- change of variables in double and triple integrals.

UNITV:

Notion of improper integrals, their convergence, simple tests for convergence simple problems, Beta and Gamma integrals-their properties, relation between them- evaluation of multiple integrals using Beta and Gamma functions.

Treatment as in

1. Calculus vol 1 and vol 2"-- S. Narayanan and T.K.M. Pillai. Viswanathan Publishers

Reference:

1. Mathematics for BSc – Vol I and. II - P. Kandasamy & K.Thilagarathy S.Chand and Co-2004
2. A Text book of calculus- Shanthi Narayanan & J.N.Kapoor, S.Chand & Co.

Semester: II - Core Paper- III

Subject title: Analytical Geometry **Credit hours-4**

Subject Description:

This course gives emphasis to enhance student knowledge in two dimensional and three dimensional analytical geometry. Particularly about two dimensional conic sections in polar coordinates and the geometrical aspects of three dimensional figs, viz, sphere, cone and cylinder.

Goal:

To enable the students to learn and visualize the fundamental ideas about co-ordinate geometry.

Objectives:

On successful completion of the course students should have gained knowledge above the regular geometrical figures and their properties.

UNIT I:

Analytical geometry of 2D-polar coordinates equation of a conic -directrix-chord-tangent-normal- simple problems.

UNIT II:

Analytical Geometry 3D-stright.lines-coplanarity of straight-line-shortest distance (S.D) and equation of S.D between two lines-simple problems.

UNIT III:

Sphere: standard equation of sphere-results based on the properties of a sphere-tangent plane to a sphere- equation of a circle.

UNIT IV:

Cone and cylinder: Cone whose vertex is at the origin- envelope cone of a sphere-right circular cone-equation of a cylinder-right circular cylinder.

UNIT V:

Conicoides: Nature of a conicoide- standard equation of central conicoid –enveloping cone- tangent plane-condition for tangency –director Sphere- director plane

Treatment as in

1. Analytical Geometry by P. Durai Pandian & others
2. Solid Geometry by N.P. Bali- Laxmi Publications (P) Ltd

Reference:

1. Analytical Geometry of 2D by T.K. M. Pillai and Others – Visvanathan Publications- 2006
2. Solid Geometry by M.L. Khanna- Jainath & Co Publishers, Meerut

Semester II - Core Paper – IV

Subject Title: Trigonometry, Vector Calculus and Fourier Series

Credit Hours: 5

Subject Description : This course presents the circular functions, hyperbolic functions, differentiation of functions in scalar and vector field.

Goals: To enable the students to learn about the expansion of trigonometrical functions and to gain knowledge about vector treatment which will help them to deal the analytical geometry problems using vector method.

Objectives: On successful completion of this course the students should have gained knowledge about expansion of trigonometric functions, line integral, surface integral, volume integral and Fourier series.

Unit I:
Expansion in Series – Expansion of $\cos^n \theta$, $\sin^n \theta$, in a series of cosines and sines of multiples of θ – Expansions of $\cos n\theta$ and $\sin n\theta$ in powers of sines and cosines – Expansion of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in powers of θ – hyperbolic functions and inverse hyperbolic functions.

Unit II:
Logarithm of complex quantities - summation of series – when angles are in arithmetic progression – C + iS method of summation – method of differences.

Unit III:
Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl.

Unit IV:
Integration of vectors – line integral – surface integral – Green's theorem in the plane – Gauss divergence theorem – Strokes theorem – (Statements only) - verification of the above said theorems.

Unit V:
Periodic functions – Fourier series of periodicity 2π – half range series.

Treatment as in

1. Kandasamy. P, Thilagavathi. K " Mathematics for B.Sc. Branch I", Volume I, II and IV, S.Chand and Company Ltd, New Delhi, 2004. (for Unit I).

References:

1. P. Duraipandian, Laxmiduraipandian - Vector Analysis (Revised Edition-Reprint 2005) Emerald Publishers.

2. T.K. Manichavasagam Pillai and S.Narayanan, Trigonometry - Viswanathan Publishers and Printers Pvt. Ltd.

Semester: III - Core paper V

Subject Title: Differential Equations and Laplace Transforms **Credit Hours: 3**

Subject Descriptions:

This course presents the method of solving ordinary differential Equations of First Order and Second Order, Partial Differential equations. Also it deals with Laplace Transforms, its inverse and Application of Laplace Transform in solving First and Second Order Differential Equations with constant coefficients.

Goals: It enables the students to learn the method of solving Differential Equations.

Objectives: End of this course, the students should gain the knowledge about the method of solving Differential Equations. It also exposes Differential Equation as a powerful tool in solving problems in Physical and Social sciences.

Unit I:

Ordinary Differential Equations: Equations of First Order and of Degree Higher than one – Solvable for *p, x, y* – Clairaut's Equation – Simultaneous Differential Equations with constant coefficients of the form

i) $f_1(D)x + g_1(D)y = \phi_1(t)$

ii) $f_2(D)x + g_2(D)y = \phi_2(t)$

where f_1 , g_1 , f_2 and g_2 are rational functions $D = \frac{d}{dt}$ with constant coefficients ϕ_1 and ϕ_2 explicit functions of *t*.

Unit II:

Finding the solution of Second and Higher Order with constant coefficients with Right Hand Side is of the form Ve^{ax} where *V* is a function of *x* – Euler's Homogeneous Linear Differential Equations – Method of variation of parameters.

Unit III:

Partial Differential Equations: Formation of equations by eliminating arbitrary constants and arbitary functions – Solutions of P.D Equations – Solutions of Partial Differential Equations by direct integration – Methods to solve the first order P.D. Equations in the standard forms - Lagrange's Linear Equations.

Unit IV:

Laplace Transforms: Definition – Laplace Transforms of standard functions – Linearity property – Firsting Shifting Theorem – Transform of $tf(t)$, $\frac{f(t)}{t}$, $f^1(t)$, $f^{11}(t)$.

Unit V:

Inverse Laplace Transforms – Applications to solutions of First Order and Second Order Differential Equations with constant coefficients.

Treatment as in

Kandasamy. P, Thilagavathi. K "Mathematics for B.Sc – Branch – I Volume III", S. Chand and Company Ltd, New Delhi, 2004.

References:

1) S. Narayanan and T.K. Manickavasagam Pillai, Calculus, S. Viswanathan (Printers and Publishers) Pvt. Ltd, Chennai 1991
2) N.P. Bali, Differential Equations, Laxmi Publication Ltd, New Delhi, 2004
3) Dr. J. K. Goyal and K.P. Gupta, Laplace and Fourier Transforms, Pragali Prakashan Publishers, Meerut, 2000

Semester: III - Core Paper – VI

Subject title: Statics **Credit hours: 3**

Subject Description:

This course contains the nature of forces acting on a surface, friction and center of gravity.

Goal:

To enable the students to realize the nature of forces and resultant forces when more than one force acting on a particle.

Objectives:

On successful completion of course the students should realize the concept about the forces, resultant force of more than one force acting on a surface, friction and center of gravity. Also he can differentiate static and dynamic forces.

UNIT-I

Forces acting at a point – Parallelogram law-triangle law-(λ,μ) theorem-Polygon of forces-conditions of equilibrium.

UNIT- II

Parllel Forces-Moments and couples composition of parallel forces (like and unlike)-Moment of a force about a point-Varignons theorem.

UNIT – III

Co-planar forces acting on a rigid body – Theorem on three co-planar forces in equilibrium-reduction of a system of co-planar forces to a single force and a couple - necessary & sufficient conditions of equilibrium only – Equation to the line of action of the resultant.

UNIT – IV

Friction:

Laws of friction-angle-co efficient, and cone of friction.

UNIT – V

Center of gravity (using integration only)-Equilibrium of strings and chains.

Treatment as in

M.K.Venkataraman, Statics, Agasthiar Publications, Trichy, 1999.

References

1. A.V.Dharmapadam, Statics , S.Viswanathan Printers and Publishing Pvt., Ltd, 1993.
2. P.Duraipandian and Laxmi Duraipandian, Mechanics , S.Chand and Company Ltd, Ram Nagar, New Delhi -55, 1985.
3. Dr.P.P.Gupta, Statics , Kedal Nath Ram Nath, Meerut, 1983-84.

Semester III - Diploma Course

Subject title: Diploma in Operations Research – Paper I **Credit hours: 3**

Subject description:

This course contains advantages, limitations and applications of O.R, formulation of Linear Programming Problems (L.P.P), methods to solve L.P.P. like simplex method, Charnes Penality Method and Two Phase Simplex method. Also it deals about duality in L.P.P, Transportation and Assignment Problems with applications

Goal:

It enables the students to use the mathematical knowledge in optimal use of resources.

Objectives:

On successful completion of this course students should have gained knowledge about optimal use of resources.

Unit I:

Basics of O.R – Definition of O.R – Characteristics of O.R - Scientific methods in O.R – Necessary of O.R in Industry – O.R and Decision Making – Scope of O.R in Modern Management – Uses and limitations of O.R. Linear Programming Problem – Formulation of L.P.P – Graphical solutions of L.P.P – Problems.

Unit II:

Simplex Method – Charnes Penality Method (or) Big – M Method - Two Phase Simplex method – Problems.

Unit III:

Duality in L.P.P – Concept of duality – Duality and Simplex Method – Problems

Unit IV:

The transportation Problems – Basic feasible solution by L.C.M – NWC- VAM- optimum solutions – unbalanced Transportation problems

Unit V:

The Assignment Problems – Assignment algorithm – optimum solutions – Unbalanced Assignment Problems.

References:

1. Operations Research – Prem Kumar Gupta D. S. Hira, S. Chand & Company Ltd, Ram Nagar, New Delhi
2. Operations Research – Kandiswarup, P. K. Gupta, Man Mohan, S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.
3. Operations Research Principles and Problems: S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd.

SEMESTER IV - Core Paper – VII

Subject title: Dynamics **Credit hours: 3**

Subject Description: This course provides the knowledge about the field Kinematics, projectile, simple harmonic motion and impact of a particle on a surface.
Goal: To enable the students to apply Laws, Principles, Postulates governing the Dynamics in physical reality.
Objectives: End of this course, the student understand the reason for dynamic changes in the body.

UNIT – I

Kinematic-Velocity-Accelaration.

Motion of a straight line: Equations of motion –acceleration of falling bodies-vertical motion under gravity-motion down a smooth inclined plane.

Laws of Motion:

Newtons laws of motion, Newton's law of gravitation-conservation of linear momentum-work done by an elastic string-conservative forces-energy-potential energy and Kinetic energy-principle of energy.

UNIT – II

Projectiles: Path of a projectile-Greatest height-time of filght-range on an inclined plane through the point of projection-Maximum range.

UNIT – III

Central Orbits: Radial and transverse components of velocity and acceleration – areal velocity – central orbits – Differential equation of a central orbit in polar coordinates.

UNIT – IV

Simple Harmonic Motion: Amplitude, periodic time, phase-composition of two simple harmonic motions of the same period in a straight line and in two perpendicular lines.

UNIT – V

Impact on a fixed surface: Impulsive force-Impact on a smooth fixed plane –Direct and oblique impact of two smooth spheres – loss of Kinetic energy during direct and oblique impacts.

Treatment as in

M.K.Venkataraman, Dynamics, 11th Ed. Agasthiar Publications, Trichy, 1994.

References

1. A.V.Dharamapadam , Dynamics, S.Viswanathan Printers and Publishers Pvt., Ltd, Chennai, 1998.
2. K.Viswanatha Naik and M.S.Kasi, Dynamics, Emerald Publishers, 1992.
3. Naryanamurthi, Dynamics, National Publishers, New Delhi, 1991.

SEMESTER IV:GROUP A –CORE PAPER VIII

Subject Title: Programming in C * **No.of.Hours: 3**

Subject Description: This paper presents the importance of c language, its structure, Data types, Operators of C, Various control statements, Arrays, different types of functions and practical problems.
Goals: To enable the students to learn about the basic structure, Statements, arrays, functions and various concepts of C language.
Objectives: On successful completion of the course the students should have:
Learnt the basic structure, operators and statements of c language.
Learnt the decision making statements and to solve the problems based on it.
Learnt arrays,functions and solve the problems Regarding about it.

UNIT I: Introduction – Importance of C Basic structure of c programme Character set- Constants – Keywords and identifiers – Variables Data types – Declaration of variables –Assigning values to variables –Defining symbolic constants.

UNIT II: Arithmetic operators - Relational operators - logical operators – assignment operators – increment and decrement operates –Conditional operators – Special operators – Arithmetic expressions –Evaluation of expressions –Precedence of arithmetic operators – Some computational problems –Type conversion in expressions – operator precedence and associating mathematical functions.

UNIT III: Reading and Writing character – formatted input and output. Decision making with IF statement – Simple IF statement – The if ELSE statement Nesting of IF…..ELSE statement – The ELSE IF ladder. The Switch statement –The? Operator –The GOTO statement.The WHILE statement - the DO statement the FOR statement –Jumps in loops.

UNIT IV: One, Two dimensional arrays – Initiating two dimensional arrays – Multidimensional arrays –Declaring and initializing string variables –reading strings from terminal – Writing strings on the screen – Arithmetic operations on characters.

UNIT V: Pointers- understanding pointers –Accessing the address of a variable – Declaring and initializing pointers – Accessing a variable through its pointers – pointer expressions – Pointer increments and scale factor – Pointers and arrays – Pointers and functions void printers.

TEXT BOOK:

E.Balagurusamy“Programming in ANSI C” Second Edition – Tata McGraw –Hill Publishing company limited, New Delhi.

REFERENCE BOOKS:

1.Byron Gottfried “Programming with C”(Schaum’s outline series)-Tata McGrawHill publishing company -1998.
2. Ashok N.Kamthane “Programming with Ansi and Turbo C”, Pearson Education publishers, 2002
3.Hentry Mullish and Herbert L cooper , “The spirit of C” Jaico publisher , 1996.
4.THE ANSI C, Second edition , October 1992.BRIAN W.KERNIGHAN,DENNIS M.RITCHIE

Published by Prentice- Hall of India Privated Limited, M-97,New Delhi- 110001.
5.ANSI C: With Microsoft C 5.1 and Quick C 2.0 C.Balasubramanian.1992, Tata McGraw-Hill Publishing company limited, New Delhi.
6. "PROGRAMMING IN C ", Kris A.Jamsa 1992 , Galgotia Publications Pvt.ltd.

B.SC., MATHEMATICS DEGREE COURSE C-PROGRAMMING PRACTICAL LIST.

1. **Write a C program to generate 'N' Fibonacci number.**

2. **Write a C program to print all possible roots for a given quadratic equation.**

3. **Write a C program to calculate the statistical values of mean, median, mode, Standard Deviation and variance of the given data**

4. **Write a C program to sort a set of numbers using the functions.**

5. **Write a C program to sort the given set of names and assign roll numbers.**

6. **Write a C program to search a required element in a list using binary search.**

7. **Write a C program to find factorial value of a given number 'N' using recursive function call.**

8. **Write a C program to find inverse and determinant of a given matrix.**

9. **Write a C program to find number of palindromes in a given sentence.**

10. **Write a C program to prepare pay list for a given data.**

11. **A file contains the name of students with their initials at the beginning . Write a program to read this file and write their names in another file with the initials at the end.**

12. **Convert a word star file into an ASCII file and store it another file.**

Semester IV - Diploma Course

Subject title: Diploma in Operations Research – Paper II **Credit hours: 3**

Subject Description:

This course gives emphasis to enhance student knowledge in game theory, performance measures of queues, optimal use of Inventory and Network scheduling with application.

Unit I:

Game Theory – Two person zero sum game – The Maxmini – Minimax principle – problems - Solution of 2 x 2 rectangular Games – Domination Property – (2 x n) and (m x 2) graphical method – Problems.

Unit II:

Queueing Theory – Introduction – Queueing system – Characteristics of Queueing system – symbols and Notation – Classifications of queues – Problems in (M/M/1) : (∞/FIFO); (M/M/1) : (N/FIFO); (M/M/C) : (∞/FIFO); (M/M/C) : (N/FIFO) Models.

Unit III:

Inventory control – Types of inventories – Inventory costs – EOQ Problem with no shortages – Production problem with no shortages – EOQ with shortages – Production problem with shortages – EOQ with price breaks.

Unit IV:

Simulation – Introduction – simulation models – Event – Types of simulation - Generation of Random Numbers – Mante-carlo simulation – simulation of queueing system.

Unit V:

Network scheduling by PERT / CPM – Introduction – Network and basic components – Rules of Network construction – Time calculation in Networks – CPM.

PERT – PERT calculations – Cost Analysis – Crashing the Network – Problems.

References:

1. Operations Research – Prem Kumar Gupta D. S. Hira, S. Chand & Company Ltd, Ram Nagar, New Delhi
2. Operations Research – Kandiswarup, P. K. Gupta, Man Mohan, S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.
3. Operations Research Principles and Problems: S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd.

SEMESTER V - Core Paper – IX

Subject title: Real Analysis - I **Credit hours: 5**

Subject Description: This course focuses on the Real and Complex number systems, set theory, point set topology and metric spaces.

Goal: To introduce the concepts which provide a strong base to understand and analysis mathematics.

Objective: On successful completion of this course the students should gain the knowledge about real and complex numbers, sets and metric space.

UNIT I

The Real and Complex number systems the field axioms, the order axioms –integers –the unique Factorization theorem for integers –Rational numbers –Irrational numbers –Upper bounds, maximum Elements, least upper bound –the completeness axiom –some properties of the supremum –properties of the integers deduced from the completeness axiom- The Archimedian property of the real number system –Rational numbers with finite decimal representation of real numbers –absolute values and the triangle inequality –the Cauchy-Schewarz, inequality –plus and minus infinity and the extended real number system.

UNIT II

Basic notions of a set theory. Notations –ordered pairs –Cartesian product of two sets – Relations and functions – further terminology concerning functions –one –one functions and inverse – composite functions –sequences –similar sets-finite and infinite sets –countable and uncountable sets –uncountability of the real number system –set algebra –countable collection of countable sets.

UNIT III

Elements of point set topology: Euclidean space R^n –open balls and open sets in R^n. The structure of open Sets in R^n –closed sets and adherent points –The Bolzano –Weierstrass theorem – the Cantor intersection Theorem.

UNIT IV

Covering –Lindelof covering theorem –the Heine Borel covering theorem –Compactness in R^n –Metric Spaces –point set topology in metric spaces –compact subsets of a metric space – Boundary of a set.

UNIT V

Convergent sequences in a metric space –Cauchy sequences –Completeness sequences – complete metric Spaces. Limit of a function –Continuous functions –continuity of composite functions. Continuous complex valued and vector valued functions.

Treatment as in

T.M.Apostol, Mathematical Analysis, 2nd ed., Narosa Publishing Company, Chennai, 1990.

Unit I	Chapter 1	Sections 1.2, 1.3, 1.6 to 1.16, 1.18 to 1.20
Unit II	Chapter 2	Sections 2.2 to 2.15
Unit III	Chapter 3	Sections 3.2 to 3.9
Unit IV	Chapter 3	Sections 3.10 to 3.16
Unit V	Chapter 4	Sections 4.2 to 4.5, 4.8 to 4.15

References

1. R.R.Goldberg, Methods of Real Analysis, NY, John Wiley, New York 1976.
2. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw – Hill, New York, 1963.
3. G.Birkhoff and MacLane, A survey of Modern Algebra, 3rd Edition, Macmillian, New York, 1965.
4. J.N.Sharma and A.R.Vasistha, Real Analysis, Krishna Prakashan Media (P) Ltd, 1997.

SEMESTER V - Core Paper – X

Subject title: Complex Analysis - I **Credit hours: 6**

Subject Description: This course provides the knowledge about complex number system and complex functions.

Goal: To enable the students to learn complex number system, complex function and complex integration.

Objectives: On successful completion of this course the students should gained knowledge about the origin, properties and application of complex numbers and complex functions.

UNIT I

Complex number system, Complex number –Field of Complex numbers – Conjugation – Absolute value -Argument –Simple Mappings.

i) $w = z + \alpha$ ii) $w = az$ iii) $w = 1/z$

invariance of cross-ratio under bilinear transformation –Definition of extended complex plane – Stereographic projection.

UNIT II

Complex functions: Limit of a function –continuity –differentiability – Analytical function defined in a region –necessary conditions for differentiability –sufficient conditions for differentiability –Cauchy-Riemann equation in polar coordinates –Definition of entire function.

UNIT III

Power Series: Absolute convergence –circle of convergence –Analyticity of the sum of power series in the Circle of convergence (term term differentiation of a series) Elementary functions : Exponential, Logarithmic, Trigonometric and Hyperbolic functions.

UNIT IV

Conjugate Hormonic functions: Definition and determination, Conformal Mapping: Isogonal mapping –Conformal mapping-Mapping z--->>f(z), where f is analytic, particularly the mappings.

$w= e^z$; $w = z^{1/2}$; w=sin z ; w =1/2(z +1/z)

UNIT V

Complex Integration: Simply and multiply connected regions in the complex plane. Integration of f(z) from definition along a curve joining z_1 and z_2. Proof of Cauchy's Theorem (using Goursat's lemma for a simply connected region). Cauchy's integral formula for higher derivatives (statement only)-Morera's theorem.

Treatment as in

P.Duraipandian and Laxmi Duraipandian, Complex Analysis, Emerald Publishers, Chennai –2, 1986.

Unit I	Chapter 1	Sections 1.1 to 1.3, 1.6 to 1.9
	Chapter 2	Sections 2.1 to 2.2, 2.6 to 2.9,
	Chapter 7	Section 7.1
Unit II	Chapter 4	Sections 4.1 to 4.10
Unit III	Chapter 6	Sections 6.1 to 6.11
Unit IV	Chapter 6	Sections 6.12 to 6.13
	Chapter 7	Sections 7.6 to 7.9
Unit V	Chapter 8	Sections 8.1 to 8.9

References

1. Churchill and Others, Complex Variable and Applications, Tata Mecgrow Hill Publishing Company Ltd, 1974.
2. Santhinarayan , Theory of functions of Complex Variable, S.Chand and Company, Meerut, 1995.
3. Tyagi B.S. Functions of Complex Variable, 17th Edition, Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93.

SEMESTER V - Core Paper – XI

Subject title: Modern Algebra - I **Credit hours: 6**

Subject description: This course provides knowledge about sets, mappings, different types of groups and rings.
Goals: To enable the students to understand the concepts of sets, groups and rings. Also the mappings on sets, groups and rings.
Objective: On successful completion of course the students should have concrete knowledge about the abstract thinking like sets, groups and rings by proving theorems.

UNIT I

Sets – mappings – Relations and binary operations – Groups: Abelian group, Symmetric group Definitions and Examples – Basic properties.

UNIT II

Subgroups – Cyclic subgroup - Index of a group – Order of an element – Fermat theorem - A Counting Principle - Normal Subgroups and Quotient Groups.

UNIT III

Homomorphisms – Cauchy's theorem for Abelian groups – Sylow's theorem for Abelian groups Automorphisms – Inner automorphism - Cayley's theorem, permutation groups.

UNIT IV

Rings: Definition and Examples –Some Special Classes of Rings – Commutative ring – Field – Integral domain - Homomorphisms of Rings.

UNIT V

Ideals and Quotient Rings – More Ideals and Quotient Rings – Maximal ideal - The field of Quotients of an Integral Domain

Treatment as in

I.N. Herstein, Topics in Algebra, John Wiley & Sons, New York, 2003.

Unit I	Chapter 1	Sections 1.1 to 1.3,
	Chapter 2	Sections 2.1 to 2.3
Unit II	Chapter 2	Sections 2.4 to 2.6
Unit III	Chapter 2	Sections 2.7 to 2.10
Unit IV	Chapter 3	Sections 3.1 to 3.3
Unit V	Chapter 3	Sections 3.4 to 3.6.

References

1. Surjeet Singh and Qazi Zameeruddin, Modern Algebra, Vikas Publishing house, 1992.
2. A.R.Vasishtha, Modern Algebra, Krishna Prakashan Mandir, Meerut, 1994 - 95.

SEMESTER – V - GROUP C – APPLICATION ORIENTED SUBJECT

SUBJECT TITLE: ASTRONOMY – I **CREDIT HOURS: 5**

Subject Description : This course focuses on the Solar system, Celestial sphere, Dip-Twilight & Keplar's laws.

Goal: To enable the students to understand the Astronomical aspects and about the laws governing the planet movements.

Objectives: On successful completion of this course the students should gain knowledge about Astronomy.

UNIT I:

General description of the Solar system. Comets and meteorites – Spherical trigonometry.

UNIT II:

Celestial sphere – Celestial co – ordinates – Diurnal motion – Variation in length of the day.

UNIT III:

Dip – Twilight – Geocentric parallex.

UNIT IV:

Refration – Tangent formula – Cassinis formula.

UNIT V:

Kepler's laws – Relation between true eccentric and mean anamolies.

Treatment as in "ASTRONOMY" by S.Kumaravelu and Susheela Kumaravelu.

Question paper setters to confine to the above text book only.

SEMESTER – V - GROUP C – APPLICATION ORIENTED SUBJECT
NUMERICAL METHODS - I

Subject Description:

This course presents method to solve linear algebraic and transcendental equations and system of linear equations. Also Interpolation by using finite difference formulae.

Goal:

It exposes the students to study numerical techniques as powerful tool in scientific computing.

Objective:

On successful completion of this course the student gain the knowledge about solving the linear equations numerically and finding interpolation by using difference formulae.

Unit I: The solution of numerical algebraic and transcendental Equations:

Bisection method – Iteration Method – Convergence condition – Regula Falsi Method – Newton – Raphson method - Convergence Criteria – Order of Convergence.

Unit II: Solution of simultaneous linear algebraic equations:

Gauss elimination method – Gauss Jordan method – Method of Triangularization – Crouts method – Gauss Jacobi method – Gauss Seidel method

Unit III: Finite Differences:

Differences – operators – forward and backward difference tables – Differences of a polynomial – Factorial polynomial – Error propagation in difference table.

Unit IV: Interpolation (for equal intervals):

Newton's forward and backward formulae – equidistant terms with one or more missing values – Central differences and central difference table – Gauss forward and backward formulae – Stirlings formula.

Unit V: Interpolation (for unequal intervals):

Divided differences – Properties – Relations between divided differences and forward differences – Newton's divided differences formula – Lagrange's formula and inverse interpolation.

Treatment as in

Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chand and Company Ltd, New Delhi – Revised Edition 2007. (Chapters: 3,4,5,6,7 and 8).

References:

1. Venkataraman M. K.,"Numerical Methods in Science and Engineering" National Publishing company V Edition 1999.
2. Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2nd Edition Prentice Hall India 2004.

SEMESTER – V - GROUP C – APPLICATION ORIENTED SUBJECT

Subject Title: DISCRETE MATHEMATICS **Credit Hours: 5**

Subject Description: This course focuses on the mathematical logic, Relations& Functions, Formal languages and Automata, Lattices and Boolean Algebra and Graph Theories.

Goal: To enable the students to learn about the interesting branches of Mathematics.

Objectives: On successful completion of this course should gain knowledge about the Formal languages Automata Theory, Lattices & Boolean Algebra and Graph Theory.

UNIT-I:

Mathematical logic: Connections well formed formulas, Tautology, Equivalence of formulas, Tautological implications, Duality law, Normal forms, Predicates, Variables, Quantifiers, Free and bound Variables. Theory of inference for predicate calcules.
(1-2, 1-2.7. 1-2.9, 1-2.10, 1-2.11, 1-3, 1-5.1, 1-5.2, 1-5.4, 1-6.4)

UNIT-II:

Relations and functions: Composition of relations, Composition of functions, Inverse functions, one-to- one, onto, one-to-one& onto, onto functions, Hashing functions, Permutation function, Growth of functions. Algebra structures: Semi groups, Free semi groups, Monoids, Groups, Cosets, Sets, Normal subgroups, Homomorphism.
(2-3.5, 2-3.7, 2-4.2, 2-4.3, 2-4.6, 3-2, 3-5, 3-5.3, 3-5.4)

UNIT-III:

Formal languages and Automata: Regular expressions, Types of grammar, Regular grammar and finite state automata, Context free and sensitive grammars.
(3-3.1, 3-3.2, 4-6.2)

UNIT-IV:

Lattices and Boolean algebra: Partial ordering, Poset, Lattices, Boolean algebra, Boolean functions, Theorems, Minimisation of Boolean functions.
(4-1.1, 4-2, 4-3, 4-4.2)

UNIT-V:

Graph Theories: Directed and undirected graphs, Paths, Reachability, Connectedness, Matric representation, Eular paths, Hamiltonean paths, Trees, Binary trees simple theorems, and applications. (5-1.1, 5-1.2, 5-1.3, 5-1.4)

Text Books:

J.P Tremblay and R.P Manohar “Discrete Mathematical Structures with applications to computer science”, Mc.Graw Hill, 1975.

SEMESTER – V - GROUP C – APPLICATION ORIENTED SUBJECT A

Subject Title: GRAPH THEORY **Credit Hours-**5

Subject Description:

This course focuses on the Graphs, Sub Graphs, Trees, Planar graphs, Directed graphs. It also deals about matrix representation of Graphs.

Goal:

To enable the students to understand the basic concepts of Graph Theory.

Objectives:

On successful completion of this course the students should gain knowledge about Graph Theory.

UNIT I:

Graphs –Sub graphs – Degree of a vertex walks, paths and cycles in a Graphs – connectedness cut vertex and cut edge.

UNIT II:

Entoriom and Hamiltonion Graphs – Algorithm for Entoriom circuits – Bipartite Graphs –Trees.

UNIT III:

Matrix representation of a graph – vector spaces, associated with a graph – cycle spaces and act set spaces.

UNIT IV:

Planar graphs – Enter's theorem on planar graphs – characterization of planar graphs (no proofs) of the difficult part of the characterization.

UNIT V:

Directed graphs – Connectivity – Enteoriom Digraphs – Tournaments.

Treatment as in "A First Course in Graph Theory" by A.Chandran (Macmillan)
Chapters 1 to 7.

Books for References:

1.Narasingh Deo, "Graph Theory" (Prentice Hall of India).
2. Harary: "Graph Theory" (Narosa Publishing HQCK).

SEMESTER – V - GROUP C – APPLICATION ORIENTED SUBJECT

Subject Title: RDBMS AND ORACLE * No.Of.Hours:5

Subject Description: This paper presents the basic concepts of DBMS, Keys, RDBMS, introduction to SQL, ORACLE data types, Queries in SQL, introduction to PL/SQL, its basic structure, triggers, basic concepts of forms, reports and practical problems.
Goals: To enable the students to learn about the basic concepts of DBMS, RDBMS, SQL, PL/SQL, forms and Reports.
Objectives: On successful completion of the course the students should have
learnt the basic concepts of DBMS and RDBMS.
Learn to build a queries using SQL, PL/SQL.
Learnt to design a forms and reports using ORACLE Developer 2000.

UNIT –I:

Basic concepts of DBMS – Entities and their attribute Keys – Prime Keys, secondary keys, Super Keys, Candidate Keys, Alternative Keys - Examples, Relationship – Records and files, Data independence, Views – Types of Views, Components of a DBMS, DDL, DML, DQL. Advantages and disadvantages of DBMS, RDBMS –Relational Database – Relations and their schemes – Relation representation – Integrity rules.

TEXT BOOKS:

For unit 1 treatment as in "Introduction to Database System" –BipinDesai [chapter 1,sections 4.2 and 6.5.1 and 6.5.2]

UNIT II:

Integrative SQL –invoking SQL plus, data manipulation in DBMS ,The ORACLE data types, two dimention matrix creation, Intersectior of data into tables, data constrains, computation in expression lists used to select data, logical operation, Range searching, pattern matching, Orac'e function, Grouping data from tables in SQL , Manipulating dates on SQL, joins, sub queries.

UNIT III:

PL/SQL-Introduction, The PL/SQL execution enviornment, the PL/SQL syntax, Understanding the PL/SQL Block structure, database triggers.

UNIT IV:

Working with forms, Basic concepts, Application development in forms, Form module, Blocks items, Canvas view windows, Creating a form Generating and running a form, Using the Layout editor ,Master form, Triggers, Data Navigation Via an Oracle form ,Master detail form, Creating a master detail form, Master detail data entry screen.

UNIT V:

Working with reports ,Defining a data model for report , specific the layout of a report, use the Oracle reports interface, Creating a default tabular report, Creating computed columns, Creating user parameter, Arranging the layout, Creating a Master / Detail report, Creating a matrix report.

TEXT BOOK:

For units 2, 3, 4, 5, treatment as in 'Commercial application Development using Oracle developer 2000' by IVAN BAYROSS.

RDBMS PRACTICAL LIST

1. Create a table 'company' with the following fields and insert the values for 10 employees.

Field Name	**Field Type**	**Field Size**
Company Name	Character	15
Proprietor	Character	15
Address	Character	25
Supplier Name	Character	15
No of employees	Number	4
GP percent	Number	6 with 2 decimal places

Queries:

a) Display all the records of the company which are in the ascending order of GP percent.

b) Display the detail of the company having the employee ranging from 300 to 1000.

2.Create a table named 'employee' with the following field and insert the values.

Field Name	**Field Type**	**Field Size**
Employee Name	Character	15
Employee code	Character	6
Address	Character	25
Designation	Character	15
Grade	Character	1
GP percent	Number	6 with 2 decimal places

Queries:

a) Display the name of the employees whose salary is greater than Rs.10, 000

b) Display the details of employees in ascending order according to employee code.

c) Display the total salary of the employees whose grade is "A".

3.Create a table named "student" with the following fields and insert the values:

Field Name	**Field Type**	**Field Size**
Student Name	Character	15
Gender	Character	6
Roll No	Character	10
Department Name	Character	15
Address	Character	25
Percentage	Number	4 with 2 decimal places

Queries:

a) Display the names of the students whose percentage is greater than 80.

b) Display the details of the student whose percentage is between 50 and 70.

c) Display the details of the students whose percentage is greater than the percentage of the Roll no =12CA01.

4.Create a table "product" with the following fields and insert the values:

Field Name	**Field Type**	**Field Size**
Product No	Number	6
Product Name	Character	15
Unit of Measure	Character	15
Quantity	Number	6 with decimal places
Total Amount	Number	8 with decimal places.

Queries:

a) Using update statements calculate the total amount and then select the record.

b) Calculate the total amount by using sum operation.

c) Calculate the number of records whose unit price is greater than 50 with count Operation.

5.Create the table PAYROLL with the following fields and insert the value:

Field Name	**Field Type**	**Field Size**
Employee No	Number	8
Employee Name	Character	8
Department	Character	10
Basic pay	Number	8 with 2 decimal places.
HRA	Number	6 with 2 decimal places.
DA	Number	6 with 2 decimal places.
PF	Number	6 with 2 decimal places.
Net Pay	Number	8 with 2 decimal places.

Queries:

a) Update the record to calculate the net pay

b) Arrange the records of employees in ascending order of their net pay.

c) Select the details of employees whose HRA >= 1000 and DA <= 900.

d) Display the details of the employee whose department is sales.

6.Create a table publisher and book with the following fields:

Field Name	**Field Type**	**Field Size**
Publisher Code	Varchar	5
Publisher Name	Varchar	10
Publisher City	Varchar	12
Publisher State	Varchar	10
Title of book	Varchar	15
Book Code	Varchar	5
Book Price	Varchar	5

Queries:

a) Insert the records into the table publisher and book

b) Describe the structure of the tables

c) Show the details of the book with the title ‘DBMS’.

d) Select the book code , book title , publisher city is ‘Delhi’.

e) Find the name of the publisher starting with ‘s’.

7.Create a table Deposit and loan with the following fields.

Field Name	**Field Type**	**Field Size**
Account	Varchar	6
Branch Name	Varchar	15
Customer Name	Varchar	20

Balance Amount	Varchar	10
Loan Number	Varchar	7
Loan Amount	Varchar	6

Queries:

a) Insert the records into the table.
b) Describe the structure of the table
c) Display the records of Deposit and loan
d) Find the Maximum loan amount
e) Arrange the records in descending order of the loan amount

Semester V - Diploma Course

Subject title: Diploma in Operations Research – Paper III - Credit hours: 3

Subject Description:

This course presents applications and method to solve Integer Programming Problems, Non-linear Programming Problems and Dynamic Programming problems. It also includes Markov Analysis and Decision Analysis.

Unit I:

Integer Programming Problem – Gromory's fractional cut Method – Branch Boud Method.

Unit II:

Non-linear Programming Problems – General NLPP – Lagrange multiplier – Hessian bordered Matrix – Kuhn Tucker Condition – Problems

Unit III:

Dynamic Programming Problem – Recursive equation approach – D.P.P Algorithm – Solution of L.P.P by D.P.P.

Unit IV:

Markov Analysis – Stochastic process – Markov analysis Algorithm.

Unit V:

Decision Analysis – Decision Making environment – Decisions under uncertainty – Decision under risk – Decision – Tree Analysis.

References:

1. Operations Research – Prem Kumar Gupta D. S. Hira, S. Chand & Company Ltd, Ram Nagar, New Delhi
2. Operations Research – Kandiswarup, P. K. Gupta, Man Mohan, S. Chand & Sons Education Publications, New Delhi, 12th Revised edition.
3. Operations Research Principles and Problems: S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd

SEMESTER VI - Core Paper – XII

Subject Title: REAL ANALYSIS - II **Credit hours: 5**

Subject Description: This course presents nature of functions and mappings like continuity, connectivity, and derivative. It also includes the concept of monotonic functions with properties and Riemann - Stieltjes integral.

Goal: To introduce the concepts which provide a strong base to understand and analysis mathematics.

Objective: On successful completion of this course the students should gain the knowledge about the nature of functions mappings.

UNIT I

Examples of continuous functions –continuity and inverse images of open or closed sets –functions continuous on compact sets –Topological mappings –Bolzano's theorem.

UNIT II

Connectedness –components of a metric space – Uniform continuity : Uniform continuity and compact sets –fixed point theorem for contractions –monotonic functions.

UNIT III

Definition of derivative –Derivative and continuity –Algebra of derivatives – the chain rule – one sided derivatives and infinite derivatives –functions with non-zero derivatives –zero derivatives and local extrema –Roll's theorem –The mean value theorem for derivatives –Taylor's formula with remainder.

UNIT IV

Properties of monotonic functions –functions of bounded variation –total Variation –additive properties of total variation on (a, x) as a function of x – functions of bounded variation expressed as the difference of increasing functions –continuous functions of bounded variation.

UNIT V

The Riemann - Stieltjes integral : Introduction –Notation –The definition of Riemann –Stieltjes integral –linear properties –Integration by parts –change of variable in a Riemann –stieltjes integral – Reduction to a Riemann integral.

Treatment as in

Tom. M. APOSTOL, Mathematical Analysis, 2nd ed., Addison-Wisely. Narosa Publishing Company, Chennai, 1990.

Unit I	Chapter 4	Sections 4.11 to 4.15
Unit II	Chapter 4	Sections 4.16, 4.17, 4.19, 4.20, 4.21, 4.23
Unit III	Chapter 5	Sections 5.2 to 5.10 and 5.12
Unit IV	Chapter 6	Sections 6.2 to 6.8
Unit V	Chapter 7	Sections 7.1 to 7.7

References

1. R.R.Goldberg, Methods of Real Analysis, NY, John Wiley, New York 1976.
2. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw – Hill, New York, 1963.
3. G.Birkhoff and MacLane, A survey of Modern Algebra, 3rd Edition, Macmillian, NewYork, 1965.
4. J.N.Sharma and A.R.Vasistha, Real Analysis, Krishna Prakashan Media (P) Ltd, 1997.

SEMESTER VI - Core Paper – XIII

Subject title: COMPLEX ANALYSIS - II **Credit hours: 6**

Subject Description: This course provides the knowledge about complex functions with some fundamental theorems. Singularity and residues in complex functions, integrations of complex functions and meromorphic functions

Goal: To enable the students to learn complex number system, complex function and complex integration.

Objectives: On successful completion of this course the students should gained knowledge about the complex functions and its nature.

UNIT I

Results based on Cauchy's theorem(I) : Zeros-Cauchy's Inequality – Lioville's theorem – Fundamental theorem of algebra –Maximum modulus theorem –Gauss mean value theorem – Gauss mean value theorem for a harmonic function on a circle .

UNIT II

Results based on Cauchy's theorem (II) –Taylor's series –Laurent's series .

UNIT III

Singularities and Residues: Isolated singularities (Removable Singularity, pole and essential singularity) –Residues –Residue theorem.

UNIT IV

Real definite integrals: Evaluation using the calculus of residues – Integration on the unit circle –Integral with $-\infty$ and $+\infty$ as lower and upper limits with the following integrals:

i) P(x) /Q(x) where the degree of Q(x) exceeds that of P(x) at least 2.
ii) (sin ax).f(x), (cos ax).f(x), where a>0 and f(z) $\rightarrow$ 0 as z$\rightarrow\infty$ and f(z) does not have a pole on the real axis.
iii) f(x) where f(z) has a finite number of poles on the real axis.
Integral of the type $\int_x^{a-1} x/(1+x)\,dx$; 0< a <1;

UNIT V

Meromorphic functions: Theorem on number of zeros minus number of poles –Principle of argument: Rouche's theorem – Theorem that a function which is meromorphic in the extended plane is a rational function.

Treatment as in

P. Duraipandian and Laxmi Duraipandian, Complex analysis, Emerald Publishers, Chennai – 2, 1997.

Unit I	Chapter 8	Sections 8.10, 8.11
Unit II	Chapter 9	Sections 9.1 to 9.3, 9.13.
Unit III	Chapter 9	Sections 9.5 to 9.12, 9.13.
	Chapter 10	Sections 10.1, 10.2 and 10.4.
Unit IV	Chapter 10	Sections 10.3 and 10.4.
Unit V	Chapter 11	Sections 11.1 to 11.3 (Omit theorems 11.5 and 11.6)

References

1. Churchill and Others, Complex Variable and Applications, Tata Mecgrow Hill Publishing Company Ltd, 1974.
2. Santhinarayan , Theory of functions of Complex Variable, S.Chand and Company ,Meerut, 1995.
3. Tyagi B.S , Functions of Complex Variable, 17th Edition, Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93.

SEMESTER VI - Core Paper – XIV

Subject title: MODERN ALGEBRA - II **Credit hours: 6**

Subject description:

This course provides knowledge about elementary operations on matrices, different types of matrices, rank of a matrix, spaces and linear transformations.

Goals:

It enables the students to understand the concept of matrices and linear transformations.

Objective:

On successful completion of course the students should have concrete knowledge about the elementary operations on matrices, characteristic vector of a square matrix, vector spaces and linear transformations.

UNIT I

Matrices: Introduction – Addition and Scalar Multiplication of Matrices – Product of Matrices –Transpose of a Matrix – Matrix Inverse – Symmetric and Skew - Symmetric Matrices.

UNIT II

Hermitian and Skew-Hermitian Matrices – Orthogonal and Unitary Matrices – Rank of a Matrix –Characteristic Roots and Characteristic Vectors of a Square Matrix.

UNIT III

Vector space: Elementary Basic Concepts – Subspace of a Vector space - Homomorphism – Isomorphism - Internal and External direct sums - Linear span - Linear Independence and Bases.

UNIT IV

Dual Spaces – Annihilator of a subspace - Inner Product Spaces – Norm of a Vector – Orthogonal Vectors - Orthogonal Complement of a subspace – Orthonormal set.

UNIT V

Linear Transformations: Algebra of Linear Transformations – Regular, Singular Transformations – Range of T – Rank of T - Characteristic Roots – Characteristic Vectors - Matrices.

Treatment as in

1. R.Balakrishnan and M. Ramabadran, Modern Algebra, Vikas Publishing House Pvt. Ltd, New Delhi, (Second Revised Edition 1994) (For Units I & II)

Unit I	Chapter 1	Sections 1.1 to 1.3, 1.5 to 1.7
Unit II	Chapter 1	Sections 1.8 and 1.9
	Chapter 2	Section 2.9
Chapter 3	Section 3.9	

2. I.N. Herstein, Topics in Algebra, John Wiley & Sons, New York, 2003. (For Units III, IV & V)

Unit III	Chapter 4	Sections 4.1 and 4.2
Unit IV	Chapter 4	Sections 4.3 and 4.4
Unit V	Chapter 6	Sections 6.1 , 6.2 and 6.3

References

1. Surjeet Singh and Qazi Zameeruddin, Modern Algebra, Vikas Publishing house, 1992.
2. A.R.Vasishtha, Modern Algebra, Krishna Prakashan Mandir, Meerut, 1994 – 95.
3. Seymour Lipschutz and Marc Lipson, Linear Algebra, 3rd Edition, McGraw Hill, 2001.

SEMESTER VI - GROUP C - APPLICATION ORIENTED SUBJECT

Subject Title: ASTRONOMY II **Credit Hours -5**

Subject Description:

This course focuses on the Time, Annual Parallax, Precession, Nutation and The Moon, Eclipses.

Goal: To enable the students to learn about the interesting facts of Moon, Sun Planetory Motion.

Objectives: On successful completion of this course the students should gain knowledge about Astronomy.

UNIT-I:

Time: Equation of time – Convertion of time – Seasons – Calendar.

UNIT-II:

Annual Parallax – Abberation.

UNIT-III:

Precession – Nutation.

UNIT-IV:

The Moon – Eclipses.

UNIT-V:

Planetory Phenomenon – The Stellar system.

Treatment as in "ASTRONOMY" by Mr.S.Kumaravelu and Susheela Kumaravelu.

Question paper setters to confine to the above text book only.

SEMESTER VI - GROUP C - APPLICATION ORIENTED SUBJECT
Numerical Methods II

Subject Description:

This course presents Numerical differentiation, Numerical integration and method to solve the differential equations.

Goal:

It exposes the students to study numerical techniques as powerful tool in scientific computing.

Objective:

On successful completion of this course the student gain the knowledge about solving the linear equations numerically and finding interpolation by using difference formulae.

Unit I: Numerical differentiations:

Newton's forward and backward formulae to compute the derivatives – Derivative using Stirlings formulae – to find maxima and minima of the function given the tabular values.

Unit II: Numerical Integration:

Newton – Cote's formula – Trapezoidal rule – Simpson's 1/3rd and 3/8th rules – Gaissian quadrature
– two points and three points formulae

Unit III: Difference Equation:

Order and degree of a difference equation – solving homogeneous and non – homogeneous linear difference equations.

Unit IV:

Taylor series method – Euler's method – improved and modified Euler method – Runge Kutta method(fourth order Runge Kutta method only)

Unit V: Numerical solution of O.D.E(for first order only):

Milne's predictor corrector formulae – Adam-Bashforth predictor corrector formulae – solution of ordinary differential equations by finite difference method (for second order O.D.E).

Treatment as in

Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chand and Company Ltd, New Delhi – Revised Edition 2007.
(Chapters: 9,10,11, Appendix and Appendix E).

References:

1. Venkataraman M. K.,"Numerical Methods in Science and Engineering" National Publishing company V Edition 1999.
2. Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2nd Edition Prentice Hall India 2004.

SEMESTER VI - GROUP C - APPLICATION ORIENTED SUBJECT

AUTOMATA THEORY AND FORMAL LANGUAGES

UNIT – I

Introduction – phrase structure languages.

UNIT – II

Closure operations.

UNIT – III

Context free languages.

UNIT – IV

Finite state automata.

UNIT – V

Push down automata.

Content and treatment as in, 'Formal Languages and Automata' by Rani Sriomoney.
Revised edition 1984.Pulishied by the Christian Literary Society, Madras-3
Chapters 1 to 6.

Reference Books:

1. Hopcrot and still man-Formal languages and their relation automata-Addision Wesley.
2. R.Y.Kulin-Automata theory-Machines and Languages-McGraw Hill.

SEMESTER VI - GROUP C - APPLICATION ORIENTED SUBJECT

Subject Title: PROGRAMMING IN C++ * **No. of Hours: 3**

Subject Description: This paper presents the importance of object oriented language, drawbacks of procedure oriented programming, OOPs concepts, class structure, operators, the types of inheritance & polymorphism, Files, Streams and Exception handling & templates.
Goals: To enable the students to learn about the basic OOPs concepts, class structure, operators, inheritance, polymorphism, files, Exception handling and Templates.
Objectives: On successful completion of the course the students should have
learnt the drawbacks of Pop and Need for OOP &OOPs concepts
Learnt class structure, member functions & data members.
Learnt the concept of inheritance, types and example problems.
Learnt the concepts of polymorphism, types and problems.
Learnt files, streams and Exception handling & Templates with practical problems.

Reference Books:

1. “Object Oriented Programming using C++”, S.K.Chadha, Amit Chadha Kalyani Publishers –New Delhi, 2001-2002.
2. “Object oriented programming in Turbo C++”,-Robert Lafore-Galgotia- publications Pvt.Ltd, New Delhi- 110002 11994.
3. Programming with C++-D.Ravi Chandran -1996, Tata McGraw- Hill publishing company limited, New Delhi.
4. Ashok N.Kamthane, “Object Oriented Programming with Ansi and Turbo C++”, Pearson Education publishers, 2003.
5. John R.Hubbard “Programming with C++”, 2nd Edition, TMH publishers,2002.

UNIT-I:

Evolution of programming languages- -drawbacks of classical methods- need for object orientation – conventional programming versus object oriented programming – properties – treatment of object, class and association of objects.

UNIT-II:

Object oriented design – object oriented database – object oriented user interface – garbage collection and exception handling, Evolution of C++ - C verses C++ - C++ programming basics - data type - include directories – loops and decisions - structures - functions.

UNIT-III:

Object and classes – messages – access specifier – data encapsulation definition and declaration of member functions – static class data – constructor and destructor – copy constructor – in line function – static data members and function – pointers and references – this pointer – strings – new and delete operators - object I/O streams.

UNIT-IV:

Polymorphism – operator overloading – function overloading –overloading unary operators – overloading binary operators – data convertion and pitfalls of operator overloading – friend function – friend class, single inheritance – multiple inheritance- inheritance access spcifier - derived and base class – static and dynamic binding – virtual function – pure virtual function – virtual base class – abstract class.

UNIT-V:

Files and streams – string I/O – object I/O stream class – error handling – redirection – command line arguments – exception handling – container classes – templates – simple templates – list templates – function templates – templates arguments.

Text Books:

1. E.Balagurusamy ‘Object Oriented programming with C++’, McGraw Hill
2. Bjarne Stroutstrup, ‘The C++ programming language’, II Edition, Addision Wesley, 1991.
3. Grady Booch, ‘Object Oriented Analysis and Design’ The Benjamine and Cummins publications, 1993.

SEMESTER VI - GROUP C - APPLICATION ORIENTED SUBJECT PROGRAMMING IN C++ PRACTICAL LIST.

1.Create a class to implement the data structure STACK.Write a constructor to initialize the TOP of the stack to 0. Write a member function PUSH(). To insert an element and a member function POP() to delete an element. Check for overflow and underflow conditions.

2.Create a class ARITH which consists of a FLOAT and an INTEGER variable . Write member functions ADD(), SUB(), MUL(), DIV(), MOD() to perform addition, multiplication, division, and modulus respectively. Write member functions to get and display values.

3.Create a class which consist of employee detail ENO,ENAME,DEPT,BASIC SALARY.Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA,HRA and PF depending on the grade and display the PAY Slip in a neat format using console I/O.

4.Define two classes polar and rectangle to represent points in the polar and rectangle system. Use coversion routines to convert from one system to another.

5. Create a class FLOAT that contains one float data member overload all the four arithmetic operators so that operate on the objects of FLOAT.

SEMESTER VI - GROUP C - APPLICATION ORIENTED SUBJECT INTERNET AND JAVA PROGRAMMING * No. of credit hours: 3

Subject description:

This paper presents the introduction to internet, ISP, mail, web, URLS, schemes, browser, HTML, Usenet, Gopher, veronica, Jug head, Anonymous ftp, archie, telnet, talk, IRC and muds, Java introduction, data types, operators, statements, class, packages, interfaces, exception handling, threads, applets and AWTS.

Goals:

To enable the students to study about internet,mail,web, HTML,Usenet, Gopher, veronica, Jug head, Archie and Java fundamentals, class, packages, exception handling,threads,applets and AWTS.

Objectives:

On successful completion of the course the students should have:
Learnt the basic concept of internet, mailing, HTML, Archie, telnet, ftp and IRC muds.
Learnt about Java fundamentals, operators and statements.
Learnt the concept of packages, interfaces and exception handling.
Learnt the concept of threads, applets and AWTS.

UNIT I:

Introduction to Internet- Resources of Internet -hardware and software requirements of internet- Internet service providers (ISP)-Internet addressing- Mail Using mail from a shell account - Introduction to web- using the web.

UNIT II:

URLs, schemes host names and port numbers- Using the browser Hypertext and HTML- Using the web from a shell account Introduction to Usenet - Reading and posting Usenet articles- Using Usenet from a shell account- Gopher ,Veronica and Jug head- Using gopher from a shell account.

UNIT III:

Anonymous ftp- Using ftp from a shell account-archie-file type uses on the internet downloading software - mailing lists- telnet- Using telnet from a seller account talk fecilities- Using talks from a shell account – talk felicities – using talks from a shell account – IRC and muds .

UNIT IV:

Features of java - java environment - comparing java with C++ - introduction to java language -types - operators - flow control - classes - packages and interfaces.

UNIT V:

Java classes - string handling- exception handling - threads and synchronization -utilities - input / output - networking - applets - abstrct windows toolkit (AWT)-imaging.

Text book:

1. Harley Hahn, The internet -Complete reference, second edition, Tata McGraw Hill, 1996.
2. Patric Naughton, Java Hand Book, Tata McGraw Hill, 1996

COURSE INTERNET AND JAVA PROGRAMMING PRACTICAL LIST

1.Create web pages using HTML to display ordered and unordered list of a departmental store.
2.Program to display image and text using HTML tag for a advertisement of a company product.
3.Create web pages for a business organization using HTML frames.
4.Create a web site of your department with minimum links using HTML .
5.Create a document using formatting and alignment tags in HTML.
6.Write a Java program to print the triangle of numbers.
7.Write a program which creates and displays a message on the windows.
8.Write a program to draw several shapes in the created window.
9.Write a Java program to accept values and find the given no. is even or odd. .
10. Write a Java program to calculate standard deviation.

Semester VI - Diploma Course

SUBJECT TITLE; OPERATION RESEARCH –- Paper IV CREDIT HOURS: 3

PROJECT AND VIVA-VOCE:

PROJECT AREAS (BROAD FIELD)

1. Linear Programming Problems
2. Transportation Problems.
3. Assignment Problems
4. Inventory Control.
5. Queuing Models
6. PERT
7. Stochastic Process
8. Decision Analysis.

PROJECT : 75 MARKS
VIVA VOCE : 25 MARKS
TOTAL: 100 MARKS

(FOR CANDIDATES ADMITTED FROM 2007-2008)

BSc Degree Examination.

First Semester

PART - III - Mathematics and Maths with CA

CLASSICAL ALGEBRA

Time: 3 hrs Max. Marks: 100

SECTION A - (10×1 = 10 marks)

1. The Coefficient of x^7 in $(1-x)^{-3}$ is ——
$(1-x)^{-3}$ ன் விரிவில் x^7-ன் குணகம் ——.

2. The coefficient of x^{10} in the expansion of $\frac{1+2x-3x^2}{e^x}$ is ——
$\frac{1+2x-3x^2}{e^x}$ ன் விரிவின் x^{10} ன் குணகம் ——.

3. Find the range in which $\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \ldots$ is valid.
$\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \ldots$ ன் வீச்சுத்தின் எல்லையைக் காண்க.

4. If ΣU_n, ΣV_n are two series of positive terms and the second series is convergent then find the condition for U_n and V_n
ΣU_n, ΣV_n என்ற மிகை உறுப்புகளைக் கொண்ட இரு தொடர்களில் இரண்டாவது தொடர் ஒருங்கும் தன்மையை கொண்டது எனில் U_n மற்றும் V_n-ன் நிபந்தனையை காண்க.

5. $\lim_{n\to\infty} n\left(\frac{U_n}{V_{n+1}} - 1\right) = -\frac{1}{2}$ then find ΣU_n
$\lim_{n\to\infty} n\left(\frac{U_n}{V_{n+1}} - 1\right) = -\frac{1}{2}$ எனில் ΣU_n காண்க.

6. The series $\Sigma \frac{1}{\sqrt{n}} \tan(1/n)$ is ——
(a) Convergent (b) divergent (c) absolutely Convergent (d) None.
$\Sigma \frac{1}{\sqrt{n}} \tan(1/n)$ ஆனது (அ) ஒருங்கும் (ஆ) விரியும் (இ) முற்றிலும் ஒருங்கும் (ஈ) இவற்றில் எதும் இல்லை.

7. If $\sqrt{5}+\sqrt{2}$ is a root of the equation $x^4 - 14x^2 + 9 = 0$ then other roots are ——
$x^4 - 14x + 9 = 0$ என்ற சமன்பாட்டின் ஒரு மூலம் $\sqrt{5}+\sqrt{2}$ எனில் மற்றவை ——

8. If $\alpha, \beta, \gamma, \delta$ be the roots of the biquadratic equation $x^4 + px^3 + qx^2 + rx + s = 0$ then $\Sigma\alpha^2 =$ ——
$x^4 + px^3 + qx^2 + rx + s = 0$ என்ற நான்கு படி சமன்பாட்டின் மூலங்கள் $\alpha, \beta, \gamma, \delta$ எனில் $\Sigma\alpha^2 =$ ——

9. Find the nature of the roots of the equation $x^5 - 6x^2 - 4x + 5 = 0$
$x^5 - 6x^2 - 4x + 5 = 0$ என்ற சமன்பாட்டின் மூலங்களை காண்க.

10. State the formula for Newton's method.

நியூட்டனின் சூத்திரத்தை எழுதுக.

SECTION B (5×6 = 30 marks)

11. (a) Show that $\sqrt{x^2+16} - \sqrt{x^2+9} = \frac{7}{2x}$ nearly for sufficiently large values of x.

x-ன் மிகப்பெரிய மதிப்பிற்கு $\sqrt{x^2+16} - \sqrt{x^2+9} = \frac{7}{2x}$ என நிறுவுக

(OR)

(b) Sum the series $\frac{5}{1!} + \frac{7}{3!} + \frac{9}{5!} + \ldots\ldots$

$\frac{5}{1!} + \frac{7}{3!} + \frac{9}{5!} + \ldots$ என்ற தொடரின் கூடுதல் காண்க.

12. (a) If a, b, c denote the three consecutive integers, show that $\log_e b = \frac{1}{2}\log_e a + \frac{1}{2}\log_e c + \frac{1}{2ac+1} + \frac{1}{3}\cdot\frac{1}{(2ac+1)^3} + \ldots$

a, b, c என்பன அடுத்தடுத்த மூன்று எண்கள் எனில்

$\log_e b = \frac{1}{2}\log_e a + \frac{1}{2}\log_e c + \frac{1}{2ac+1} + \frac{1}{3}\cdot\frac{1}{(2ac+1)^3} + \ldots$ என நிறுவுக.

(OR)

(b) Find whether the series in which $u_n = (n^3+1)^{\frac{1}{3}} - n$ is convergent or divergent.

$u_n = (n^3+1)^{1/3} - n$ என்ற உறுப்பைக் கொண்ட தொடரானது அடங்குமா அல்லது விரியுமா என ஆராய்க.

13. (a) Examine the convergency of the following series $\sum_{n=1}^{\infty}\left\{\frac{\sqrt{n+1}-\sqrt{n}}{n^p}\right\}$

$\sum_{n=1}^{\infty}\left\{\frac{\sqrt{n+1}-\sqrt{n}}{n^p}\right\}$ என்ற தொடரானது அடங்குமா என ஆராய்க.

(OR)

(b) Examine the convergency of the series $\sum_{n=1}^{\infty}\left(\frac{n}{n+1}\right)^{1/2} x^n$

$\sum_{n=1}^{\infty}\left(\frac{n}{n+1}\right)^{1/2} x^n$ என்ற தொடரின் அடங்குதல் தன்மையை ஆராய்க.

14. (a) Solve the equation $81x^3 - 18x^2 - 36x + 8 = 0$ whose roots are in H.P

$81x^3 - 18x^2 - 36x + 8 = 0$ என்ற சமன்பாட்டின் மூலங்கள் இசைத் தொடரில் அமைந்தால் அம்மூலங்களைக் காண்க.

(OR)

(b) If the roots of $x^3 + 3ax^2 + 3bx + c = 0$ are in H.P then show that $2b^3 = c(3ab - c)$

$x^3 + 3ax^2 + 3bx + c = 0$ என்ற சமன்பாட்டின் மூலங்கள் இசைத் தொடரில் அமைகிறது எனில் $2b^3 = c(3ab - c)$ என நிறுவுக.

15. (a) Solve the equation $6x^5+11x^4-33x^3-33x^2+11x+6=0$

தீர்க்க : $6x^5+11x^4-33x^3-33x^2+11x+6=0$

(OR)

(b) Increase by 7 the roots of the equation $3x^4+7x^3-15x^2+x-2=0$

$3x^4+7x^3-15x^2+x-2=0$ என்ற சமன்பாட்டின் மூலங்கள் 7 அதக உயர்த்தப்பட்ட சமன்பாடாக மாற்றி அமை.

SECTION-C (5×12 = 60 marks)

16. (a) Find the sum to infinity of the series

$$\frac{1}{24}-\frac{1.3}{24.32}+\frac{1.3.5}{24.32.40}-\cdots$$

முடிவிலி வரை கூடுதல் காண்க $\frac{1}{24}-\frac{1.3}{24.32}+\frac{1.3.5}{24.32.40}-\cdots$

(OR)

(b) Sum the series $\sum_{n=1}^{\infty}\frac{n^3+3}{n+2}\frac{x^n}{n!}$

கூடுதல் காண்க $\sum_{n=1}^{\infty}\frac{n^3+3}{n+2}\frac{x^n}{n!}$

17. (a) State and Prove Raabe's test

ரேபின் சோதனையை எழுதி நிறுவு.

(OR)

(b) Settle the range of values of x for which the following series convergent

(i) $\sum\frac{x^n}{1+n^2x^{2n}}$ (ii) $\sum\frac{x^n}{1+x^{2n}}$

கீழ்க்கண்ட தொடர்களின் x-ன் எந்த எல்லை மதிப்புகளுக்கு (வீச்சு) நிறையும் (i) $\sum\frac{x^n}{1+n^2x^{2n}}$ (ii) $\sum\frac{x^n}{1+x^{2n}}$

18. (a) Discuss the convergency of the following series

(i) $\sum(-1)^{n-1}\frac{1}{n^p}$ when $0<p<1$ (ii) $\sum\frac{3^n(n!)}{n^n}$ (iii) $\sum\frac{1}{n(\log n)^p}$

கீழ்க்கண்ட தொடர்களின் ஒருங்குதல் தன்மைகளை ஆராய்க

(i) $\sum(-1)^{n-1}\frac{1}{n^p}$ ($0<p<1$ எனும்வரையறுக்க) (ii) $\sum\frac{3^n(n!)}{n^n}$

(iii) $\sum\frac{1}{n(\log n)^p}$

(OR)

19. (a) Find the condition that the roots of the equation $ax^3+3bx^2+3cx+d=0$ may be in G.P. Solve the equation $27x^3+42x^2-28x-8=0$ whose roots are in G.P.

$ax^3+3bx^2+3cx+d=0$ என்ற சமன்பாட்டின் மூலங்கள் பெருக்குத்

(b) If α, β, γ are the roots of $x^3+px^2+qx+r=0$ form the equation whose roots are $\beta+\gamma-2\alpha$, $\gamma+\alpha-2\beta$, $\alpha+\beta-2\gamma$

$x^3+px^2+qx+r=0$ என்ற சமன்பாட்டின் மூலங்கள் α, β, γ எனில் $\beta+\gamma-2\alpha$, $\gamma+\alpha-2\beta$, $\alpha+\beta-2\gamma$ என்பனவற்றை மூலங்களாக கொண்டு அமைக்கப்படும் சமன்பாட்டைக் காண்க.

20. (a) Show that the equation $x^4-3x^3+4x^2-2x+1=0$ can be transform into reciprocal equation by diminishing the roots by unity. Hence solve the equation.

$x^4-3x^3+4x^2-2x+1=0$ என்ற சமன்பாட்டின் மூலங்களை ஒன்றால் இறைத்து கிடைக்கும் உருமாற்றப்பட்ட சமன்பாடு அதை தலைகீழ் சமன்பாடு ஆகும் என நிறுவுக. மேலும் அச் சமன்பாட்டை தீர்.

(OR)

(b) Solve the equation $x^3-3x+1=0$ by Horner's method.

$x^3-3x+1=0$ என்ற சமன்பாட்டை ஹார்னரின் முறைப்படி தீர்.

First Semester
Calculus

Time: Three hours Maximum Marks: 100 marks

Answer all questions

SECTION A (10 x1 =10 marks)

1. Find the radius of curvature $x^2 + y^2 = 16$ at (1,1) is
   $x^2 + y^2 = 16$ â¡ø õ¬÷õ¬ó,°(1,1) â¡ø ¹œOJì^¶ õ¬÷õ¬óJ¡ Ýó‹ è£ ‡è.
2. If U= $x^3 + y^3 + y^2x$ then $x\frac{\delta u}{\delta x} + y\frac{\delta u}{\delta y} =$ ……

   U= $x^3 + y^3 + y^2x$ âQ™ $x\frac{\delta u}{\delta x} + y\frac{\delta u}{\delta y} =$ ……..
3. $\int \frac{dx}{2x+4}$ =……..

   $\int \frac{dx}{2x+4}$ =…….
3. Evaluate $\int \log x dx.$

   ñFŠ¹ è£‡è. $\int \log x dx.$
4. Evaluate $\int_0^{\pi/2} \sin^4 x dx$

   ñFŠ¹ è£‡è. $\int_0^{\pi/2} \sin^4 x dx$
6. $\int_1^2 \int_2^5 xydxdy$ = -------

   $\int_1^2 \int_2^5 xydxdy$ = -------
7. $\int_0^c \int_0^b \int_0^a dxdydz$ = ------

   $\int_0^c \int_0^b \int_0^a dxdydz$ = --------
8. If u=x+y , v=x-y then $\frac{\partial(u,v)}{\partial(x,y)}$ = -------

   u=x+y , v=x-y âQ™ $\frac{\partial(u,v)}{\partial(x,y)}$ = -------
9. Evaluate $\int_0^{\pi/2} \sin^3\theta \cos\theta d\theta$

ñFŠ¹ è£‡è. $\int_0^{\pi/2} \sin^3\theta \cos\theta d\theta$

10. $\sqrt{\frac{5}{2}}$ =

$\sqrt{\frac{5}{2}}$ =

SECTION B (5 x 6 = 30 marks)

11. (a) Find the radius of curvature of the parabola $y^2 = 4ax$ at a point.

$y^2 = 4ax$ â¡ø ðóõ¬÷òˆFŸ°ã«îÂ‹ å¼ ¹œOJìˆ¶ õ¬÷õ¬óJ¡ õ¬ ÷õ£ó‹ è£‡è.

(or)

(b) Find the (p,r) equation the curve $r^2 = a^2 \cos\theta$ and hence find the radius of curvature.

$r^2 = a^2 \cos\theta$ â¡ø õ¬óõ¬÷,°õ¬÷¾ Ý°‹ ñŸÁ‹ (p,r) êñ¡ð£†¬ì è£‡è.

12. (a) Evaluate $\int \frac{2x}{\sqrt{x^2+5x+6}} dx$

ñFŠ¹ è£‡è. $\int \frac{2x}{\sqrt{x^2+5x+6}} dx$

(or)

(b) Evaluate (i) $\int_2^{\alpha} e^{-x^2} x^3 dx$ (ii) $\int x \log(x+1) dx$

ñFŠ¹ è£‡è. (i) $\int_2^{\alpha} e^{-x^2} x^3 dx$ (ii) $\int x \log(x+1) dx$

13. (a) if $I_n = \int_0^{\pi/2} x^n \cos x dx$ show that $I_n + n(n-1) I_{n-2} = \left(\frac{\pi}{2}\right)^n$ and hence find $\int_0^{\pi/2} x^3 \cos x dx$

$I_n = \int_0^{\pi/2} x^n \cos x dx$ âQ™ $I_n + n(n-1) I_{n-2} = \left(\frac{\pi}{2}\right)^n$ âù GÁ¾è. «ñ½‹ $\int_0^{\pi/2} x^3 \cos x dx$ ¡ ñFŠ¹ è£‡è

(b) Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

â¡ø cœõ†ì‹ Ü¬ìŠð´‹ ðŦJ¡ ðóŠ¹ è£‡è.

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

14. (a) Change the order of integration in $\int_0^{\alpha}\int_x^{y} \frac{e^{-y}}{y}$ dxdy and evaluate it.

(or)

(b) If (x+y+z=u, y+z=uvw then find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$

(x+y+z=u, y+z=uvw âQ™ $\frac{\partial(x,y,z)}{\partial(u,v,w)}$ è£‡è.

15. (a) Discuss the convergence (i) $\int_2^{\alpha} \frac{dx}{x^{\frac{1}{2}}}, a>0 (ii) \int_{-\infty}^{0} \frac{dx}{(1-3x)^2}$

W›,è‡ìõŸP¡ å¼ƒ™ î¡¬ñ¬ò Ýó£Œè (i) $\int_2^{\alpha} \frac{dx}{x^{\frac{1}{2}}}, a>0 (ii) \int_{-\infty}^{0} \frac{dx}{(1-3x)^2}$

(or)

(b) Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$

GÁ¾è. $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$

SECTION C (5 x 12 = 60 marks)

16. (a) Find the curvature of evaluate of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

(or)

(b)(i) State and prove Euler's theorem on homogenous function.

(ii) Verify Euler's theorem when u = $\sin\left(\frac{x-y}{x+y}\right)^{\frac{1}{2}}$

(i) å¼ ð®ˆî£ù êñ¡ð£´èÀ‚è£ù ÝŒôK¡ «îŸøˆ¬î â¿F

(ii) $\sin\left(\frac{x-y}{x+y}\right)^{\frac{1}{2}}$ â¡ø êñ¡ð£†®Ÿ°ÝŒô˜ «îŸøˆ¬î êKð£˜

17. (a) Evaluate (i) $\int \frac{dx}{3\cos x+4\sin x+6} (ii) \int \frac{dx}{x^2+6x+25}$

ñFŠ¹ è£‡è. (i) $\int \frac{dx}{3\cos x+4\sin x+6} (ii) \int \frac{dx}{x^2+6x+25}$

(or)

(b) Evaluate (i) $\int \sqrt{\frac{x-2}{5-x}} dx (ii) \int x^2 \cos x dx$

ñFŠ¹ è£‡è. (i) $\int \sqrt{\frac{x-2}{5-x}} dx (ii) \int x^2 \cos x dx$

18. (a) If $\int_0^{\pi/2} \cos^3 x \cos nx dx = f(m,n)$ then $f(m,n) = \frac{m}{m+n} f(m-1,n-1)$ prove that hence prove that $f(n,n) = \frac{\pi}{2^{n+1}}$

$\int_0^{\pi/2} \cos^3 x \cos nx dx = f(m,n)$ âQ™ $f(m,n) = \frac{m}{m+n} f(m-1,n-1)$ âù GÁ¾è. «ñ½‹ $f(n,n) = \frac{\pi}{2^{n+1}}$ âù GÁ¾è.

(or)

(b) Find the area of the cardiod r=a(1+cosθ)

r=a(1+cosθ) â¡ø õ¬óõ¬÷ Ü¬ìŠð´‹ ðFJ¡ ðóŠ¹ è£‡è

19. (a) Compute $\int_0^6 \frac{dx}{1+x^2}$ by simpson's rule taking six intervals .

A‹ê¡ MF¬ò ðò¡ð´^F $\int_0^6 \frac{dx}{1+x^2}$ ¡ ñFŠ¬ð ÝÁ Þ¬ìªõOJ™ è£‡è.

(or)

(b) Evaluate $\iiint xyzdxdydz$ over the positive octant of the sphere $x^2+y^2+z^2=a^2$ by transforming onto spherical coordinates.

20. (a) Prove that (i) $\sqrt{(n+1)} = n!, n>0$ (ii) Evaluate $\int_0^\infty e^{-x^2} dx$

(i) GÁ¾è. $\sqrt{(n+1)} = n!, n>0$ (ii) ñFŠ¹ è£‡è. $\int_0^\infty e^{-x^2} dx$

(or)

(b) Prove that $\beta(m,n) = \frac{\sqrt{(m)}\sqrt{(n)}}{\sqrt{(m+n)}}$

GÁ¾è. $\beta(m,n) = \frac{\sqrt{(m)}\sqrt{(n)}}{\sqrt{(m+n)}}$

Time: 3 Hrs **ANALYTICAL GEOMETRY** **Maximum : 100 Marks**

SECTION –A (10X1=10 MARKS)

1. Write the equation of the Normal to the conic at 'α'
   'α' Â¢¼òÐ ÜõÒ Å¨Ç ¯ Õ¨ÇÂ¢ý ¦ºíÌòÐì §¸¡ðÊý ºÁýÀ¡ð¨¼ ±ØÐ¸
2. The polar equation of a conic is _____
   a) l / r = 1- e Cosθ b) l / r = 1+ e Cosθ c) l / r = 1+ e Sinθ d) l / r = 1- e Sinθ
   ÜõÒ Å¨Ç ¯ Õ¨ÇÂ¢ý §À¡Ä¡÷ ºÁýÀ¡Î
   b) l / r = 1- e Cosθ b) l / r = 1+ e Cosθ c) l / r = 1+ e Sinθ d) l / r = 1- e Sinθ
3. The angle between the straight line having the d.c's ($l_1m_1n_1$) and ($l_2m_2n_2$) is

MathType 5.0 Equation

a) Cos θ = $l_1l_2+m_1m_2+n_1n_2$ b) sin θ = $l_1l_2+m_1m_2+n_1n_2$

c) Cos θ = $l_1l_2+m_1m_2-n_1n_2$ (d) sin θ = $l_1l_2-m_1m_2+n_1n_2$

d.c's ($l_1m_1n_1$) ÁüÚõ ($l_2m_2n_2$) ±ýÀ¨Å¸¨Ç ¾¢¨ºì¦¡¡¨ºý¸Çí¸ ¦¡¡ñ¼ þÕ §¿÷§¸¡Î¸ÙìÌ þ¨¼§Â ¯ûÇ §¸¡½õ____

4. The Lines $\frac{x-2}{-4} = \frac{y-3}{3k} = \frac{z-4}{2}$ and $\frac{x-3}{4k} = \frac{y-4}{2} = \frac{z-7}{-3}$ are perpendicular. Find the value of K.

   $\frac{x-2}{-4} = \frac{y-3}{3k} = \frac{z-4}{2}$ and $\frac{x-3}{4k} = \frac{y-4}{2} = \frac{z-7}{-3}$ ±ýÈ þÕ §¸¡Î¸Ùõ ¦ºíÌòÐ ±É¢ø ý Á¾¢ô¨Àì ¸¡ñ¸

5. Find the centre of the sphere $4x^2+4y^2+4z^2-8x+1by+24z+45=0$.

   $4x^2+4y^2+4z^2-8x+1by+24z+45=0$ ±ýÈ §¸¡Çò¾¢ý ¨ÁÂò¨¾ì ¸¡ñ¸.

6. Find the equation of the sphere having (1,-2,3)&(3,-4,5) as ends of diameter.

   (1,-2,3)&(3,-4,5) ±ýÈ ÒûÇ¢¸¨Ç þ¨½ìÌõ §¸¡ð¨¼ Å¢ð¼Á¡¸ì ¦¡¡ñ¼ §¸¡Çò¾¢ý º ÁýÀ¡ð¨¼ì ¸¡ñ¸

7. If the cone $ax^2+by^2+cz^2+2fyz+2yzx+2hxy+24x+2vy+2wz=0$ has mutually perpendicular generators, Then Find the condition.

   $ax^2+by^2+cz^2+2fyz+2yzx+2hxy+24x+2vy+2wz=0$ ±ýÈ ÜõÀ¡ÉÐ ´ýÚì¦¸¡ýÚ ¦ºíÌò¾¡¸ «¨ÁÔÁ¡Ú 3 À¢ÈôÀ¡ì¸¢¸¨Çì ¦¸¡ñÊÕìÌÁ¡É¡ø «¾ý ¿¢Àó¾¨É ¸¡ñ.

8. Write the equation of the right circular cylinder whose axis is the z axis and radius 'a'

   Z «îº¡¸×õ a ±ýÀ¨¾ ¬ÃÁ¡¸×õ ¦¡¡ñ¼ §¿÷Åð¼ ¯Õ¨ÇÂ¢ý ºÁýÀ¡ð¨¼ ±ØÐ¸.

9. Write the general equation of the ellipsoid.

   ¿£ûÅð¼ò¾¢ý ¦À¡Ð ºÁýÀ¡ð¨¼ ±ØÐ¸.

10. Write the general equation of the hyperlosolid of the sheet.

    ¸Õ¾¡û ¦¡¡ñ¼ «¾¢ÀÃÅ¨ÇÂò ¾¢ñÁò¾¢ý ¦À¡Ð ºÁýÀ¡ð¨¼ ¸¡ñ¸.

SECTION –B (5X6=30 MARKS)

11.(a) Derive the equation of the asymptotes if the conic l/r = 1+ e cosθ

   l/r = 1+ e cosθ ±ýÈ ÜõÒ ¦ÅðÊÂ¢ý ¦¾¡¨Äò ¦¾¡Î§¸¡Î¸Ç¢ý ºÁýÀ¡ð¨¼ò ¾ÕÅ¢. (or)

   (b) Derive the polar equation of a curve in l/r = 1+ e cosθ

   ´Õ ÜõÒ ¦ÅðÊÂ¢ý ºÁýÀ¡ð¨¼ l/r = 1+ e cosθ ±ýÈ ÅÊÅò¾¢ø ¾ÕÅ¢.

12.(a) Find the equation of the line through (-1, 4,6) and parallel to the line x-y+2z=5, 3x+y+z =6.

   x-y+2z=5, 3x+y+z =6 ±ýÈ §¿÷ §¸¡ðÊüÌ þ¨½Â¡¸×õ (-1, 4,6) ±ýÈ ÒûÇ¢ ÅÆ¢Â¡¸×õ ¦ºøÄìÜÊÂ §¿÷§¸¡ðÊý ºÁýÀ¡ð¨¼ò ¾ÕÅ¢.

   (or)

   (b) Obtain a symmetrical form of the equation

   2x-2y-z=2, x+2y+2z=4 of a straight line.

   2x-2y-z=2, x+2y+2z=4 ±ýÈ §¿÷§¸¡ðÊý ºÁýÀ¡ð¨¼ ºÁîº£÷ ÅÊÅò¾¢ø ¸¡ñ¸.

13.(a) Find the equation of the sphere with centre (1,2,3) and touch the plane x+2y+2z=1

   (1,2,3) ±ýÀ¨¾ ¨ÁÂÁ¡¸×õ x+2y+2z=1 ±ýÈ ¾Çò¨¾ ¦¾¡ðÎì ¦¡¡ñÎ «¨ÁÔõ ¾Çò¾¢ý ºÁýÀ¡ð¨¼ì ¸¡ñ¸.

(or)

(b) Find the equation of the sphere passing through the points (2.0,1) (1,-5,1), (0,-2,3) & (4,-1,2).

(2.0,1) (1,-5,1),(0,-2,3) & (4,-1,2)±ýÈ ÒûÇ¢¸û ÅÆ¢î¦ºøÖõ §¸¡Çò¾¢ý ºÁýÀ¡ð¨¼ì ¸¡ñ¸.

14.(a) Find the equation of the right circular cone whose vertex in the origin axis in the line x/1 = y/2 = z/3 and semi vertical angle is 30^0.

¬¾¢¨ÂÔõ ¯ îº¢Â¡¸×õx/1 = y/2 = z/3 ±ýÀ¨¾ «îº¡¸×õ «¨ÃÅð¼ §¸¡½õ 30^0 ¨ÂÔõ ¦¸¡ñ¼ §¿÷Åð¼ ÜõÀ¢ý ºÁýÀ¡ð¨¼ì ¸¡ñ¸.

(or)

(b) Find the equation of the right circular cyclinder whose axis x-1/2 =y/3 = z-3/1 and radius 2.

´Õ §¿÷Åð¼ ¯Õ¨ÇÂ¢ý «îÍx-1/2 =y/3 = z-3/1

¬Ãõ 2 ±É¢ø ¯Õ¨ÇÂ¢ý ºÁýÀ¡ð¨¼ì ¸¡ñ¸

15.(a) Find the director sphere of the conic coid $(x^2 / a^2)+ (y^2 /b^2)+ (z^2 / c^2) =1$ (or)

(b) Tangent planes are drawn to $(x^2 / a^2)+ (y^2 /b^2)+ (z^2 / c^2) =1$ through fixed point (α,β,υ) . Prove that origin generate the cone. $(\alpha x+\beta y+\upsilon z)^2 = a^2 x^2 + b^2y^2 +c^2z^2$

SECTION-C (5X 12= 60)

16 (a) Derive the equation of the tangent at 'α' to the conic l/r = 1+e cosθ.

l/r = 1+e cosθ ±ýÈ ÜõÒ ¦ÅðÊÂ¢ý §Áø 'α'-ø ¦¾¡Î§¸¡ðÊý ºÁýÀ¡ð¨¼ ÅÕÅ¢.

(or)

(b) Find the equation of normal at 'α' on the conic l/r = 1+e cosθ.

l/r = 1+e cosθ ±ýÈ ÜõÒ ¦ÅðÊÂ¢ý §Áø 'α' -ø ¦ºÍòÐ §¸¡ðÊý ºÁýÀ¡ð¨¼ ¾ÕÅ¢

17 (a) Show that the line x-1/2 = y-2/-1 = z+6/ -3 and x+2y+z+2 =0, 4x+ 5y+3z+6=0 are coplanar and find the point of intersection and the plane of coplanarity.

x-1/2 = y-2/-1 = z+6/ -3 and x+2y+z+2 =0, 4x+ 5y+3z+6=0 ±ýÈ þÕ §¸¡Î¸û ´§Ã ¾Çò¾¢ø «¨ÁóÐûÇÐ ±É¢ø ¦ÅðÎõ ÒûÇ¢¨ÂÔõ «ò¾Çò¾¢ý ºÁýÀ¡ð¨¼ì ¸¡ñ¸.

(or)

(b) Find the length and the equation of the shortest distance between the lines x-3/-1 = y-4/2 = z+2/ 1 and x-1/1 = y+7/3 = z+2/2.

x-3/-1 = y-4/2 = z+2/ 1 and x-1/1 = y+7/3 = z+2/2 ¸Ùì¸¢¨¼§Â Á£îº¢Ú ¦¾¡¨Ä× ÁüÚõ Á£îº¢Ú ¦¾¡¨Ä× «¨ÁÔõ ºÁýÀ¡ð¨¼ì ¸¡ñ¸.

18 (a) Show that the plane 2x-2y+z+12 =0 touch the sphere $x^2 + y^2 + z^2 -2x-4y+2z-3=0$ and find the point of contact.

2x-2y+z+12 =0 ±ýÈ ¾Çõ $x^2 + y^2 + z^2 -2x-4y+2z-3=0$ ±ýÈ ¾Çò¨¾ ¦¾¡Îõ ±É¢ø ¦¾¡Îõ ÒûÇ¢ ¸¡ñ¸.

(or)

(b) Obtain the equation of the sphere having the circle $x^2 + y^2 + z^2 +10y-4z-8=0$, x+y+z =3 as a great circle.

$x^2 + y^2 + z^2 +10y-4z-8=0$, x+y+z =3 ±ýÈ Åð¼ò¾¢Ä¢ÕóÐ ¦ÀÚõ Åð¼Á¡¸ì ¦¸¡ñ¼ §¸¡Çò¾¢ý ºÁýÀ¡Î ¸¡ñ¸.

19(a) Find the equation of the cone whose vertex (x,y,z) which envelops the sphere $S \equiv x^2 + y^2 + z^2 –a^2 =0$.

(x,y,z) ±Ûõ ÒûÇ¢¨Â ¯îº¢Â¡¸ì ¦¸¡ñ¼S ≡ $x^2 + y^2 + z^2 - a^2 = 0$±Ûõ §¸¡Çò¨¾ «¨ÁÌÌõ ÜõÀ¢ý ºÁýÀ¡ð¨¼ì ¸¡ñ¸

(or)

(b) Find the equation of the right circular cylinder whose guiding curve in the circle $x^2 + y^2 + z^2 = 4$, $x+y+z = 2$.

$x^2 + y^2 + z^2 = 4$, $x+y+z = 2$ ±ýÈ Åð¼ «ÊÅ¨ÇÅ¨ÃÂ¡¸ ¯ûÇ §¿÷Åð¼ ¯Õ¨ÇÂ¢ý ºÁýÀ¡ð¨¼ì ¸ñ¸.

20 (a) Find the locus of the point of intersection and three mutually perpendicular tangent plane to the central conic $ax^2 + by^2 + cz^2 = 1$.

$ax^2 + by^2 + cz^2 = 1$ ±ýÈ ¨ÁÂìÜõÒ ¦ÅðÊ ¾¢ñÁò¾¢ø ´ýÚì¦¸¡ýÚ ¡º¡Îò¾¡¸ ¯ûÇ ¡¾¡Î¾Çò¨¾ ¦ÅðÎõ ÒûÇ¢Â¢ý ¿¢ÂÁôÀ¡¨¾¨Âì ¸¡ñ¸.

(or)

(b) Find the equation of the tangent plane of the ellipsoid (x^2 /6+ y^2 / 3 + z^2 /2) =1 which intersect in the line x/3 = y-3/-3 =z/1. Find also the co-ordinate of the point of contact.

x/3 = y-3/-3 =z/1 ±ýÈ §¿÷§¸¡ðÊø ¦ÅðÎõ (x^2 /6+ y^2 / 3 + z^2 /2) =1 ¿£ûÅð¼ ¾¢ñÁò¾¢ý ¡¾¡Î ¾Çí¸Ç¢ý ºÁýÀ¡ð¨¼ì ¸¡ñ¸. §ÁÖõ «¨Å¸û ¦ÅðÎõ ÒûÇ¢¸Ç¢ý ¬Âò ¡¾¡¨Ä×¸¨Çì ¸¡ñ¸.

TRIGONOMETRY AND VECTOR CALCULUS

Time: 3 Hrs **Maximum: 100 Marks**

ANSWER ALL QUESTIONS

SECTION A (10X1=10 MARKS)

1. Write the expansion of cosnθ
   cosnθ - d; tphpit vOJf.
2. Write the expansion of sin θ
   sin θ - d; tphpit vOJf.
3. Log i =
   Log i =
4. Find Log(-e)
   Log(-e) fhz;f
5. A function F is said to be harmonic if
   (a) ∇ F =0 (b) ∇ x F=0 (c) ∇^2 F=0 (d) ∆F =0
   F rhHG ,irr;rhHghf ,Uf;f Ntz;Lkhapd;
   (m) ∇ F =0 (M)∇ x F=0 (,) ∇^2 F=0 (<) ∆F =0
6. Find the value of div (curl F).
   div (curl F) – d; kjpg;G fhz;f.
7. Write the formula for work done by the force of a vector F
   F ntf;lH vd;w tpirapdhy; nra;ag;gLk; Ntiyf;fhd tha;g;ghl;bid vOJf.
8. F is called conservation field is
   (a) F = ∇Xϕ (b) F= ∇ ϕ (c) F= ∇ ϕ d) ∇ F= 0
   F vd;gJ tUtpf;fg;gl;l fskhf ,Uf;f Ntz;Lkhapd;
   (m) F =∇Xϕ (M) F= ∇ ϕ (,) F= ∇ ϕ (<) ∇ F= 0
9. If f(x) =e^x then find the value of a_0 in [0, 2π]
   f(x) =e^x vdpy; [0, 2π] - y; a_0 - d; kjpg;G fhz;f.
10. The period which is valid for writing half range series is

(a) 0 (b) 2π (c) π (d) None of these.

xU rhHig /g+hpaH miutPr;Rj; njhlhpy; vojj;jUJ ngw;f fhytl;lk;

(m) 0 (M) 2π (,) π (<) None of these.

SECTION –B (5X6=30)

11. (a) Express Sin5θ interms of Sinθ.

(m) Sin5θ -d; tphptid Sinθ - tpy; vOJf.

(or)

(b) If tanθ / θ = 2524 / 2523 . Show that θ is approximately equal to 1^0 58′.

(M) tanθ / θ = 2524 / 2523 vdpy; θ-td; kjpg;G Njuhakhf 1^0 58′f;F rkk; vd epWTf

12. (a) Express $(-2)^{I}$ in a+ib form.

(m) $(-2)^{I}$ – I a+ib mikg;gpy; vOJ

(or)

(b) S.T Log $(1+ e^{i\alpha})$ = Log (2 cos α/2) + iα/2.

(M) Log $(1+ e^{i\alpha})$ = Log (2 cos α/2) + iα/2 vd ep&gp.

13. (a) Prove that div(gradF) = ∇^2 F

(m) div(gradF) = ∇^2 F vd epWTf.

(or)

(b) P.T. curl (ϕ f) = ϕ (∇Xf) + (∇ϕ) X f .

(M) curl (ϕ f) = ϕ (∇Xf) + (∇ϕ) X f

14 (a) Obtain ∫ A dr whose A = Zi + xj + yt . and C is the arc of the curve r= costi + sinti + tk from $t=ot_0t=2\pi$.

(m) ∫ A dr d; kjpg;G fhz;f. ,q;F A = Zi + xj + yt C vd;gJ t=0 tpy; t=2π tiuapy; r= costi + sinti + tk vd;w tistiuapy; tpy;ypd; ePsk; fhz;f.

(or)

(b) Find the work done by the force F= $3x^2$ i+ 2yzj –z^2 k in moving a particle along the curve x=2t, y= t^2 and z=t from t=0 tp t=2.

(M) t=0 tpypUe;J t=2 tiu x=2t, y= t^2 and z=t vd;w tistiuapd; kPJ Jfs;

efUtjw;F nrYj;jg;gl;l tpir F= $3x^2$ i+ 2yzj –z^2 vd;w ntf;luhy; nra;ag;gl;l Ntiyiaf; fhz;f.

15 (a) Obtain the Fourier series for f(x) =x, -π<x<π

(m) for f(x) =x, -π<x<π I /g+hpaH njhlhpy; fhz;f.

(or)

(b) Obtain the half range Cosine series for f(x) = x in 0<x<π

(M) 0<x<π f(x) = x I /g+hpaH nfhird; njhlhpy; fhz;f.

SECTION C (5X12=60)

16 (a) Prove that $2^6 \cos^7 \theta$ = cos7θ + 7 cos5θ +21 cos3θ + 35 cosθ.

(m) $2^6 \cos^7 \theta$ = cos7θ + 7 cos5θ +21 cos3θ + 35 cosθ vd epWTf

(or)

(b) Expand $\text{Cos}^4\theta\ \text{Sin}^3\ \theta$

(M) $\text{Cos}^4\theta\ \text{Sin}^3\ \theta$ – I tphpTgLj;Jf.

17 (a) Sum the series Sinα + Sin (α+β)+Sin (α+2β)+…..to n terms. (or)

(m) Sinα + Sin (α+β)+Sin (α+2β)+…..to n cWg;Gtiu $Ljy; fhz;f.

(or)

(b) Sum to infinity the series : $1+ e^2 \cos 2\theta/2! + e^4 \cos 4\theta/4! + \ldots\ldots\infty$

(M) $1+ e^2 \cos 2\theta/2! + e^4 \cos 4\theta/4! + \ldots\ldots\infty$

18 (a) Prove that

$\nabla X(\nabla Xf) = \nabla (\nabla f) - \nabla^2 f.$

(m) $\nabla X(\nabla Xf) = \nabla (\nabla f) - \nabla^2 f$ vd epWTf.

(or)

(b) P.T

$F = (3x^2 + 2y^2 +1)i+ (4xy-3y^2z-3)j + (z-y^3)k$ is irrational.

(M) $F = (3x^2 + 2y^2 +1)i+ (4xy-3y^2z-3)j + (z-y^3)k$ vd;w ntf;lH Royw;W vd epWTf.

19. (a) Using Gauss theorem find the value of $\int F.\, n\, ds$. Where $F= xy^2i + yz^2j + zx^2k$ and S is the closed surface banded by the planes x=0, x=1, y=0, y=2 z=0 & z=3.

(m) fh]; Njhw;wj;ij gad;gLj;jp $\int F.\, n\, ds$ d; kjpg;G ,q;F $F= xy^2i + yz^2j + zx^2k$, S vd;gJ x=0, x=1, y=0, y=2 z=0 & z=3 vd;w jsq;fshy; %lg;gl;l Nkw;gug;G.

(or)

(b) Evaluate $\int f\, dv$ for the vector $f = xi +yj+zk$ whose V is the regions bounded by the surface x=0, x=2, y=0, y=6, z= 4 & $z= x^2$.

(M) $\int f\, dv$ d; kjpg;G fhz;f. ,q;F vd;gJ Mfpa jsq;fs; milgLk; gFjpahFk;.

20. (a) Obtain the Fourier series for $f(x) = x^2$ where $-\pi<x<\pi$ and deduce that

$1/ 1^2 + 1/ 2^2 + 1/ 3^2 + \ldots = \pi^2 / 6.$

(m) $-\pi<x<\pi$ vd;w ,ilntspapy; $f(x) = x^2$ vd;w rhHgpd; G+hpaH njhliuf; fhz;f. mjpypUe;J $1/ 1^2 + 1/ 2^2 + 1/ 3^2 + \ldots = \pi^2 / 6.$ vd epWTf.

(or)

(b) If $f(x) = \begin{cases} -x & \text{if } -\pi <x<0 \\ x & \text{if } 0\le x\le \pi \end{cases}$ Expand f(x) as a Fourier series in the interval $(-\pi,\pi)$.

DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Time: 3 Hrs **Maximum: 100 Marks**

SECTION –A (10X1=10 MARKS)
ANSWER ALL QUESTIONS

1. Find the general solution of y-px = a/p.
   y-px = a/p – d; nghJ jPHit fhz;f.
2. Find the solution of $p^2 – 4p-12 =0$
   $p^2 – 4p-12 =0$ vd;w rkd;ghl;bd; jPHT fhz;f.
3. Find the solution $(D^3 – D) y =0$
   $(D^3 – D) y =0$ d; jPHT fhz;f.
4. If $x^2 = 1+ p^2$ then find 1/p.
   $x^2 = 1+ p^2$ vdpy; 1/p fhz;f.
5. The elimination of arbitrary constants h.k from $(x-h)^2 + (y-k) + z^2 = a^2$. is
   $(x-h)^2 + (y-k) + z^2 = a^2$ vd;gjpy; h,k vd;w nghJthd khwpypia ePf;fp fpilg;gJ
6. Find the auxillary equation of Pp+Qq =R
   Pp+Qq =R vd;gjpd; Jiz rkd;ghl;ilf; fhz;f.
7. $L \{ e^{-at} \} =$
   $L \{ e^{-at} \} =$
8. $L \{t e^{t} \} =$
   $L \{t e^{t} \} =$
9. Find $L^{-1} (1/ S^2)$
   $L^{-1} (1/ S^2)$-apidf; fhz;f.
10. Find $L^{-1} (S/ S^2 + 9)$
    $L^{-1} (S/ S^2 + 9)$ -apidf; fhz;f.

SECTION-B (5X6= 30)

11. (a) Solve : $p^2 – 5p + 6 =0$, p = dy/dx.
    (m) jPHf;f : $p^2 – 5p + 6 =0$, p = dy/dx.
    (or)
    (b) Solve : $dx / z(x+y) = dy / z(x-y) = dz/ x^2 + y^2$.
    (M) jPHf;f : $dx / z(x+y) = dy / z(x-y) = dz/ x^2 + y^2$.
12. (a) Solve $(D^2 -4D +13)y = e^{2x} \cos 3x$. (or)
    (m) jPHf;f : $(D^2 -4D +13)y = e^{2x} \cos 3x$.
    (or)
    (b) Find the particular integral of $(D^2 + 5D +6)y = x^2 e^{-x}$.
    (M) $(D^2 + 5D +6)y = x^2 e^{-x}$ – d; rpwg;G njhif fhz;f.
13. (a) Form the partial differential equation by eliminating a and b from $(x-a)^2 + (y-b)^2 + z^2 =1$. (or)
    (m) $(x-a)^2 + (y-b)^2 + z^2 =1$ ypUe;J a kw;Wk; b Mfpatw;iw ePf;Ftjd; %yk; gFjp tiff; nfO rkd;ghl;il cUthf;Ff.
    (or)
    (b) Solve : q – p + x – y = 0
    (M) jPHf;f : q – p + x – y = 0
14. (a) Find L(Sin 3t Sin 2t) (or)
    (m) L(Sin 3t Sin 2t) – iaf; fhz;f.

(or)

(b) Find L (e^{-2t} Cosht)

(m) L (e^{-2t} Cosht) – iaf; fhz;f.

15. (a) Find L^{-1} [1/ S(S+3)] (or)

(m) L^{-1} [1/ S(S+3)] – iaf; fhz;f.

(or)

(b) Find L^{-1} [S/ $(S+2)^2$]

(M) L^{-1} [S/ $(S+2)^2$] – iaf; fhz;f.

SECTION – C (5X12 =60)

16. (a) Solve (dx/dt) + 4x + 3y = t , (dy/dt)+2x+5y = e^t (or)

(m) jPHf;f : (dx/dt) + 4x + 3y = t , (dy/dt)+2x+5y = e^t.

(or)

(b) Solve p^3 – 4 xyp + $8y^2$ =0.

(M) jPHf;f : p^3 – 4 xyp + $8y^2$ =0.

17. (a) Solve x^2 (d^2y / dx^2) – 3x (dy/dx) + 5y = x^2 Sin (logx) (or)

(m) jPHf;f : x^2 (d^2y / dx^2) – 3x (dy/dx) + 5y = x^2 Sin (logx)

(or)

(b) Solve ((D^3 -$3D^2$ +3D-1)y = e^{-x} x^2

(M) jPHf;f : ((D^3 -$3D^2$ +3D-1)y = e^{-x} x^2

18. (a) Solve z = px + qy + √ 1+ p^2 + q^2. (or)

(m) jPHf;f : z = px + qy + √ 1+ p^2 + q^2.

(or)

(b) Solve 9 (p^2 z+ q^2) = 4

(M) jPHf;f : 9 (p^2 z+ q^2) = 4

19. (a) If L{ f(t) } = f(s) then prove that L { t^n f(t) }= $(-1)^n$ d^n / ds^n [f(s)]. (or)

(m) L{ f(t) } = f(s) Mdhy; L { t^n f(t) }= $(-1)^n$ d^n / ds^n [f(s)] vd epWTf.

(or)

(b) Evaluate :

(i) L {t^2cos3t}

(ii) L {t^2 e^{-t} sint}

(M) kjpg;G fhz;f :

(i) L {t^2cos3t}

(ii) L {t^2 e^{-t} sint}

20. (a) Using Laplace transform : Solve (D^2 + 4D+13)y = 2 e^{-x} given that y(0) = 0, y′ (0) = -1 (or)

(m) yhg;yh]; cUkhw;wj;ij gad;gLj;jp jPHf;f : (D^2 + 4D+13)y = 2 e^{-x} NkYk; y(0) = 0, y′ (0) = -1.

(or)

(b) Using Laplace transform, Solve : (d^2y/ dx^2) – 3(dy/dx) + 2y = 4, y(0) = 2, y′ (0) = 3.

(M) yhg;yh]; cUkhw;wj;ij gad;gLj;jp jPHf;f : (d^2y/ dx^2) – 3(dy/dx) + 2y = 4, y(0) = 2, y′ (0) = 3.

STATICS

Time : 3 hours Maximum : 100 Marks

SECTION –A (10 x 1 = 10 Marks)

Answer all questions.

1. IF forces acting at a point are equilibrium then find their resultant.
   xU Gs;spapay; nray;gLk; tpirfs; rkepiyapy; ,Ue;jhy; mtw;wpd; tpisT tpiriaf; fhz;f.
2. In (λ-μ) theorem, $\lambda\ \overline{OA} + \mu\ \overline{OB}$ = ____
   (λ-μ) Njw;wj;jpy; $\lambda\ \overline{OA} + \mu\ \overline{OB}$ = ____
3. Find the moment of the force F about O
   O – it nghWj;J tpir F - d; jpUg;G jpwidf; fhz;f.
4. If (P,p) is a couple then fine its moment.
   (P, p) vd;gj XH Roypiz vdpy; mjd; jpUg;G jpwidf; fhz;f.
5. The equation of the line of action of the resultant of system of coplanar force is _____
   xU js tpir njhFjpapd; tpisT tpirapd; Nfhl;L jpir rkd;ghL___.
6. If the algebraic sum of the moments of the forces about any point in their plane is zero then _____.
   jsj;jpy; cs;s VNjh xU Gs;spia nghWj;J tpirfspd; jpUg;Gj;jpwdpd; my;[pgphpf; $Ljy; G+[;akhf ___ Mf ,Uf;Fk;.
7. If λ the coefficient of friction than μ = _____
   cuha;T nfO μ = _____
8. Write the semi vertical angle of the cone of friction.
   cuha;T $k;gpd; miu cr;rp Nfhzj;ij fhz;f.
9. Write the intrinsic equation of the centenary
   rq;fpypaj;jpd; ts;spay;G rkd;ghl;il fhz;f.
10. If l is length of chain and the tension at A is twice that the lowest point than C μ = _____
    l vd;gJ fapw;wpd; ePsk;> A vd;w Gs;spapay; ,Otpir> mbg;Gs;spapy; ,Otpiria Nghy; ,U klq;F vdpy; _____

SECTION – B (5x6 = 30 Marks)

11 (a). State and prove triangle law of forces.
(m) Kf;Nfhz tpirfspd; tpjpia $wp epWTf.

(or)

(b). Find the resultant of any number of coplanar forces acting at a point
(M) xU Gs;spapay; nray;gLk; gy;NtW xU js tpirfspd; tpisT tpidiaf; fhz;f.

12. (a) State and prove the fundamental theorem on coplanar couples.
(m) xU js RoypizfDf;fhd mbg;gil Njw;wj;ij vOjp epWTf.

(or)

(b) P and Q are two like parallel forces acting at A and B respectively. Prove that if they interchange position the point of application of the resultant in displacement through a distance P-Q/P+Q.AB along AB.

(M) P,Q vd;gd A,B vd;w Gs;spfspy; KiwNa ,aq;Fk; xj;j miz tpirfs; vdpy; mit xd;Wf;nfhd;W ,lkhw;wk; nra;ag;gl;lhy; mtw;wpd; tpisT tpir AB – d; jpirapy; P-Q/P+Q. AB J}uk; ,lk; ngaUk; vd epWTf.

13 (a). Obtain the equation to the line of action of the resultant of a system of coplanar forces.

(m) xU js tpirfspd; tpisT tpirapd; Nfhl;L jpirapd; rkd;ghL fhz;f.

(or)

(b) Prove that if three coplanar forces acting on a rigid body keep it in equilibrium, they must be either concurrent or parallel

(M) xU fl;b Jf;fg; nghUs; kPJ ,aq;Fk; %d;W xU js tpirfs; mjid xa;T epiyapy; itj;jpUe;jhH. mt;tpirfs; xU Gs;sp top nray;gLitahfNth my;yJ ,izahfNth ,Uf;Fk; vd epWTf.

14. (a) Obtain the condition of equilibrium of three coplanar parallel forces.

(m) xU jsj;jpy; nray;gLk; miz tpirfs; rkepiyapy; ,Ug;gjw;fhd epge;jidia jUtpf;f.

(or)

(b) A uniform ladder is in equilibrium with one end resting on the ground and the other against a vertical wall. If the ground and the wall be both rough, the coefficient of friction being μ and μ' respectively, and if the ladder be on the point of slipping at both ends. Show that θ, the indignation of the ladder to the horigen is given by $\tan\theta=1-\mu\mu'/2\mu$.

(M) Vzp mjd; xU Vzp> jiuapd; kPJk; kw;nwhU Vzp nrq;Fj;jhd Rthpd; kPJk; ,Uf;f rkepiyapy; cs;sJ. jiu kw;Wk; Rtw;wpf; cuha;T nfOf;fs; KiwNa μ, μ` vdpy; ,U KidfspYk; tOf;Fk; epiyapy; ,Uf;Fk; NghJ fpil kl;lj;Jld; mJ cz;lhf;Fk; $\tan\theta=1-\mu\mu'/2\mu$ vd epWTf.

15 (a) Find the C.G of a uniform solid semisphex

(m) xU rPuhd nfl;b miu Nfhsj;jpd; Gtp <Hg;G ikak;

(or)

(b) Derive the intrinsic equation of the catenary.

(M) xU rq;fpypaj;jpd; cs;spay;G rkd;ghl;ilj; jUtpf;f.

SECTION – C (5x12=60 marks)

16 (a) State and prove Lami's theorem

(m) yhkp]; Njw;wj;ij $wp epWTf.

(or)

(b) ABC is a given triangle. Forces P,Q,R acting at the point O along the lines OA,OB,OC are in equilibrium. Prove that $P:Q:R=a^2(b^2+c^2-a^2):b^2(c^2+a^2-b^2): c^2(a^2+b^2-c^2)$if O is the circum centre of Δ ABC.

(M) ABC vd;gJ XH Kf;Nfhzk; 0 vd;w Gs;spay; OA,OB,OC vd;w jpirfspy; vd;w tpirfs; rkepiyapy; ,Ug;gpd; 0 vd;gJ Δ ABC -d; Rw;W tl;l ikankdpy; $P:Q:R=a^2(b^2+c^2-a^2):b^2(c^2+a^2-b^2): c^2(a^2+b^2-c^2)$if

17 (a) Find the resultant of two like parallel forces. Also find its position.

(m) ,U xj;j ,iztpirfspd; tpisT tpiriaf; fhz;f. NkYk; mit nray;gLk; ,lj;ij fhz;f.

(or)

(b) Prove that if two couples whose moments are equal and opposite acting the same plane rigid body they balance one another.

(m)fl;bWf;fg;gl;l nghUspd; kPJ ,U Rkypdifspd; jpUg;Gj;jpwd; rkk; NkYk; mit vjpH jsq;fspy; vjpuhf nray;glfpwJ vdpy; mit xd;iwnahd;W rkd; nra;Ak; vd ep&gp.

18 (a) Obtain the necessary and sufficient condition that a system of coplanar forces acting on a rigid body may be in equilibrium.

(M) fl;bWf;fg;gl;l nghUspd; kPJ nray;gLk; xU js tpirfspd; nfhLjp rkepiyapy; ,Ug;gjw;fhd Njitahd kw;Wk; NghJkhd epge;jidia jUf.

(or)

(b) Prove that if a system of forces act on a rigid body and if the algebraic sum of their moment, about each of three non collinear point is zero separately the system of forces will be in equilibrium.

(M) fl;bWf;fg;gl;l nghUspd; kPJ nray;gLk; tpirfspd; njhfjpapd; jpUg;Gj;jpwd;> xU Nfhl;byikahj %d;W Gs;spfis nghWj;J jdpj;jdpNa G+[;[pak; vdpy; tpir njhFjp rkepiyapy; ,Uf;Fk; vd epWTf.

19 (a) A body is at root on a rough plane inclined to the horigen at an angle greater than the angle of friction and is acted upon a force parallel to the plane and along the line of greatest slope, then show that P lies between $\omega\sin(\alpha-\lambda)/\cos(\lambda)$ and $\omega\sin(\alpha+\lambda)/\cos(\lambda)$

(m) cuha;T Nfhzj;jpw;F mjpfkhd xU Nfhzr; rha;tpYs;s xU rha;G jsj;jpy; Nky; xU nghUs; itf;fg;gl;L mjd; Nky; rha; jsj;jpw;f mizahd jpirapy; vd;Dk; tpir nray;gl;L nghUis rkepiyapy; itj;jpUf;Fkhapd; P-d; kjpg;G $\omega\sin(\alpha-\lambda)/\cos(\lambda)$ f;Fk; $\omega\sin(\alpha+\lambda)/\cos(\lambda)$ f;Fk; ,ilapy; ,Uf;Fk; vd epWTf.

(or)

(b) A square lamina whose plane is vertical rests in the ends of side against a rough vertical wall and a rough horizontal ground. If the coefficients of friction for the ground and the wall be μ and μ' respectively. Prove that when the lamina is on the point A motion, the inclination of the side in question to the horizontal in $\tan^{-1}(1-\mu\mu'/1+2\mu+\mu\mu')$

(M) xU rJu jfL epiyGj;jjhf mjd; xU gf;fj;jpd; xU Kid xU nrhunrhug; ghd ,il jsj;jpYk; kw;nwhU Kid epiyf; ve;jr; Rtw;wpy; Kl;bf; nfhz;bUf;FkhW Xa;tpy; ,Uf;fpwJ. jiu kw;Wk; myhpd; cuha;Tf; nfOf;fs; KiwNa μ and μ' vdpy; jfL efuj; Jtq;Fk; epiyapy; fpil jsj;Jld; mg;gf;fk; mikf;Fk; Nfhzk; $\tan^{-1}(1-\mu\mu'/1+2\mu+\mu\mu')$ vd epWTf.

20 (a) Find the C.G of a hollow Hemisphere.

(m) cs;sPlw;w miuf;Nfhzj;jpy; Gtp <Hg;G ikak; fhz;f.

(or)

(b) Obtain the equation of the parabolic catenary.

(M) gutisa rq;fpyplj;jpd; rkd;ghl;ilf; fhz;f.

Real Analysis - I

Time: Three hours Maximum Marks: 100 marks

Answer all questions

SECTION A (10 x1 =10 marks)

1. If a/bc and (a,b) =1, then ----------
   a/bc «ñ½‹ (a,b) =1, âQ™ ----------

2. For every real x , there is a positive integer n such that ----------
   åšªõ£¼ ªñŒ x ,‹ ---------- â¡Âñ£Á å¼ I¬è º¿ â‡ n Þ¼,‹.

3. If A and B are countable sets, then AUB is ----------
   A, B â‡Eìˆî,è èíƒèœ âQ™ AUB ----------

4. The set of all irrational numbers is ----------
   MAîºø£ â‡èO¡ èí‹ ----------

5. If x,y εR^n, then $|x.y|$ ——— $\|x\|\ \|y\|$
   x,y εR^n, âQ™ $|x.y|$ $\|x\|\ \|y\|$

6. The set $\left\{\frac{1}{n}, n = 1,2,3.....\right\}$ has ---------- as an accumulation point
   $\left\{\frac{1}{n}, n = 1,2,3.....\right\}$ â¡ø èíˆF¡ â™¬ô ¹œO ----------

7. Which of the following is compact
   H¡õ¼õùõŸÁœ â¶ è„Cîñ£ù¶?

8. Find the boundary of a set of all rational numbers in R' is ----------
   R' ™ MAîºÁ â‡èO¡ èíˆF¡ õó‹¹èœ è£‡è ----------

9. Find the limit of the sequence $\left\{\frac{1}{2^1}, \frac{1}{2^2}, \frac{1}{2^3}, ...\right\}$ ----------
   $\left\{\frac{1}{2^1}, \frac{1}{2^2}, \frac{1}{2^3}, ...\right\}$ å¿ƒ°õK¬ê å¼ƒ‹ ñFŠ¹ è£‡è ---------- ----

10. If f(x) = 2x , g(x) = cosx , then g.f(x) = ----------
    f(x) = 2x ñŸÁ‹ g(x) = cosx âQ™ g.f(x) = ----------

SECTION B (5 x 6 = 30 marks)

11. (a) State and prove Lindel of covering theorem.
    L‡ì£Š Í¼‹ «îŸøˆ¬î ÃP GÁ¾è.

    (or)

    (c) State and prove unique factorization theorem.
    åŠðŸø è£óEð´ˆ¶î™ «îŸøˆ¬î ÃP GÁ¾è.

12. (a) Prove that every subset of a countable set is countable.
â‡Eìˆî,è èíˆF¡ åšªõ£¼ à†èíº‹ â‡Eìˆî,è¶ âù GÁ¾è.

(or)

(b) If F is a collection of sets, then show that for any set B, B- $\bigcup_{A\varepsilon F} A = \bigcap_{A\varepsilon F} (B - A)$

F â¡ð¶ èíƒèO¡ ªî£Ŧ âQ™ â‰î å¼ èí‹ B,ˆ, B- $\bigcup_{A\varepsilon F} A = \bigcap_{A\varepsilon F} (B - A)$ âù è£‡è.

13. (a) Prove that the intersection of a finite collection of open sets is open.
Fø‰î èíƒèO¡ º®¾Á ªî£ŦJ¡ ªõ†´ Fø‰î èí‹ âù GÁ¾ è. (or)

(b) Prove that $\|x + y\| \le \|x\| + \|y\|$

$\|x + y\| \le \|x\| + \|y\|$ âù GÁ¾è.

14. (a) Prove that e is irrational.
e å˜ MAîºø£ â‡ âù GÁ¾è.

(or)

(b) If (s,d) is a metric subspace of (m,d) , Y is a subset of S. Show that Y is closed in s if and only
if Y= B I S for some set B which is closed M.

(s,d) â¡ð¶ (m,d) ¡ ªñ†K, àœªõO «ñ½‹ S¡ à†èí‹Y âQ™ Y â¡ð¶ S™ º®ò èíñ£è Þ¼ŠðîŸ°«î¬õò£ù¶‹ «ð£¶ñ£ù¶ñ£ù è†´Šð£´ M™ àœ÷ â‰î å¼ Í®ò
èí‹ B ,ˆY= B I S âù è£†´è.

15. (a) if $\{x_n\}$ converges in a metric space (s,d), prove that for any $\in$ >0, there is an integer N such
that d (x_n , x_m) <$\in$ for n $\ge$ N,m $\ge$ N.

(s,d) â¡ø ªñ†K, ªõOJ™$\{x_n\}$â¡ø ªî£ì˜ å¼ƒˆ âQ™ â‰î å¼ $\in$ >0 ,ˆ N â¡ø º¿
â‡ d (x_n , x_m) <$\in$ for n $\ge$ N,m $\ge$ N â¡Âñ£Á Þ¼,ˆ âù GÁ¾è.

(or)

(b) If in a metric space (s,d) , $x_n \to$ p and T = $\{x_1, x_2\}$ is the range of $\{x_n\}$then show that
(i) T is bounded (ii) P is an adherent point of T.

(s,d) â¡ð¶ ªñ†K,ªõO «ñ½‹ $x_n \to$ p ñŸÁ‹ T = $\{x_1, x_2\}$ â¡ð¶ $\{x_n\}$¡ i„² âQ™
(i) T â¡ð¶ õó‹¹¬ìò¶. (ii) P â¡ð¶ T¡ «ê˜Š¹ ¹œO âù è£†´è.

SECTION C (5 x 12 = 60 marks)

16. (a) If a and b are any two integers with greatest common divisor d, prove that there exist two
integers x and y such that d = ax +by .

a,b â¡ø Þ¼ º¿ â‡èO¡ eŠªð¼ ªð£¶ è£óE d âQ™ d = ax +by âù GÁ¾è. Þƒ°
x, y Þ¼ º¿ â‡èœ.

(or)

(b) If $x \geq 0$ prove that every integer $r \geq 1$, there is a finite decimal $r_n = a_o, a_1, a_2 \ldots\ldots\ldots\ldots a_n$ such

$$r_n \leq x \leq r_n + \frac{1}{10^n}$$

$x \geq 0$ âQ™ åšªõ£¼º¿ â‡ $r \geq 1$,° $r_n \leq x \leq r_n + \frac{1}{10^n}$ â‡µñ£Á å¼º®¾Á îêñ â‡ $r_n = a_o, a_1, a_2 \ldots\ldots\ldots\ldots a_n$ Þ¼,° âù GÁ¾è.

17. (a) Show that the set of all real numbers is uncountable.
ªñŒ â‡èO¡ èí‹ â‡Eì^î,èî™ô âù è£†´è.

(or)

(b) Let f: S $\rightarrow$ T be a function. If A and B are arbitrary subsets of S. Prove that
(i) f(A Y B) = f(A) Y f(B) (ii) f(A I B) $\leq$ f(A) I f(B)
f: S $\rightarrow$ T â¡ð¶ å˜ ê£˜¹, A, B â¡ðù S¡ à†èíƒèœ âQ™ f(A Y B) = f(A) Y f(B)
(ii) f(A I B) $\leq$ f(A) I f(B) âù GÁ¾è.

18. (a) State and prove Bolzano Weierstrass theorem.
«ð£™ê£«ù£ Mò˜v†óR¡ «îŸøˆ¬î ÃP GÁ¾è.

(or)

(b) State and prove Cantor's intersection theorem.
«è‡ì£K¡ ªõ†´^ «îŸøˆ¬î ÃP GÁ¾è.

19. (a) State and prove Heine – Borel theorem.
ªýŒ«ù - «ð£ó™ ñ¬øŠ¹ «îŸøˆ¬î ÃP GÁ¾è.

(or)

(b) If S is a subset of a metric space M. Prove that the following statements are equivalent:
(i) S is Compact. (ii) S is closed and bounded. (iii) Every infinite subset of s has an accumulation point in S.
ªñ†K,ªõO M¡ à†èí‹ S âQ™ H¡õ¼‹ ÃŸÁ,èœ å¡Á,ªè£¡Á êñ‹ âù GÁ¾è.
(i) S è„Cîñ£ù¶. (ii) S Í®ò¶ ñŸÁ‹ õó‹¹¬ìò¶.(iii) S¡ åšªõ£¼º®õŸø à†èíˆF¡ Fó†CŠ ¹œO S™ àœ÷¶.

20. (a) In the Euclidean space R^k, Prove that every Cauchy sequence is convergent.
»,O®ò¡ ªõO R^k ™ åšªõ£¼ «è£SJ¡ å¿ƒ°õK¬ê»‹ å¼ƒªñù GÁ¾è.

(or)

(b) If f and g are continuous at p then prove that $h = g \circ f$ is also continuous at P.
f ,g â¡ðù â¡ø ¹œOJ™ ªî£ì˜„Cò£è àœ÷ªîQ™ $h = g \circ f$‹ P™ ªî£ì˜„Cò£è Þ¼,° âù GÁ¾è.

COMPLEX ANANLYSIS - I

Time: Three hours Maximum Marks: 100 marks

Answer all questions

SECTION A (10 x1 =10 marks)

1. If Z_1, Z_2 are two complex numbers, then $|Z_1, Z_2|$

   Z_1, Z_2 â¡ðù Þ¼ C,èªô‡èœ âQ™ $|Z_1, Z_2|$¬ò è£‡è.

2. If ω is the cube root of unity then $1+\omega+\omega^2$ = ----------

   ω â¡ð¶ 1-¡ ºŠð® Íôè‹ âQ™ $1+\omega+\omega^2$ = ----------

3. If f(Z) is continuous at Z_0, then $\lim_{Z\to Z_0} f(Z)$ =

   F(Z) â¡ð¶ Z_0 -™ ªî£ì˜„Cò£Jï $\lim_{Z\to Z_0} f(Z)$ =

4. If f(Z) is differential at Z_0, then $\lim_{Z\to Z_0} \frac{f(Z)-f(Z_0)}{Z-Z_0}$ =

   F(Z) â¡ð¶ Z_0 -™ õ¬èJìˆî‚è¶ âQ™ $\lim_{Z\to Z_0} \frac{f(Z)-f(Z_0)}{Z-Z_0}$ =

5. For the geometric $HZ+Z^2+\ldots\ldots\ldots$ is

   $HZ+Z^2+\ldots\ldots\ldots$ â¡ø ªð¼‚°ªî£ì¼‚°

6. $\frac{e^z+e^{-Z}}{Z}$ = -------

   $\frac{e^z+e^{-Z}}{Z}$ = -------

7. If $u = x^2+y^2$ is a harmonic function then V = ------

   $u = x^2+y^2$ â¡ð¶ Þ¬î„ êˆ£˜¹ âQ™V = --------

8. If u is harmonic then $U_X^2 + U_Y^2$ = -------

   $u = x^2+y^2$ â¡ð¶ Þ¬î„ êˆ£˜¹ âQ™ $U_X^2 + U_Y^2$ = --------

9. If C: $|Z| = 2$ then find $\int_c \frac{dz}{z-1}$ =--------

   C: $|Z| = 2$ âQ™ $\int_c \frac{dz}{z-1}$ = ----------

10. If C: $|Z| = 1$ then find $\int_c \frac{e^z}{z} dz$ =--------

    C: $|Z| = 1$ âQ™ $\int_c \frac{e^z}{z} dz$ = ----------

SECTION B (5 x 6 = 30 marks)

11. (a) If Z_1, Z_2 are any complex numbers, then prove that (i) $|Z_1, Z_2| = |Z_1| + |Z_2|$ (ii) $|Z_1, Z_2|^2 = |Z_1|^2 + |Z_2|^2 + 2\,\mathrm{Re}(Z_1\overline{Z_2})$

Z_1 ñŸÁ‹ Z_2 â¡ðù C,èªô‡èœ âQ™ (i) $|Z_1, Z_2| = |Z_1| + |Z_2|$

(ii) $|Z_1, Z_2|^2 = |Z_1|^2 + |Z_2|^2 + 2\,\mathrm{Re}(Z_1\overline{Z_2})$ âù¾‹ GÁ¾è.

12. (a) Obtain the equation of a circle on the join of $A(Z_1)$ and $B(Z_2)$ as diameter.
$A(Z_1)$, $B(Z_2)$ â¡ø ¹œOè¬÷ Þ¬í,º «è£†¬ì M†ìñ£è ªè£‡ì õ†ì^F¡ êñ¡ð £´ è£‡è.

(or)

(b) Obtain the C-R equations.
C-R êñ¡ð£´è¬÷ î¼M,è.

13. (a) State and prove Abel's theorem of uniform convergence of a power series.
Ü´,º ªî£ìK™ Yó£è å¼ƒº ãð™v «îŸøˆ¬î ÃP GÁ ¾è.

(or)

(b) Prove that e^z is not defined at $Z = \infty$
$Z = \infty$ â¡ø ¹œOJ™ e^z õ¬óòÁ,è º®ò£¶ âù GÁ¾è.

14. (a) Show that $u = x^3 - 3xy^2 + x$ is a harmonic function. Find the corresponding analytic function.
$u = x^3 - 3xy^2 + x$ å¼ Þ¬ê ê£˜¹ âù GÁ¾è. Üî¡ ðº¬ø ê£˜¬ð è£‡è.

(or)

(b) Discuss the transformation $w = e^z$.
$w = e^z$ â¡ø à¼ñ£Ÿøˆ¬î MõK.

15. (a) State and prove Cauchys integral formula.
«è£CJ¡ ªî£¬è õ£ŒŠð£†¬ì, ÃP GÁ¾è.

(or)

(b) Evaluate $\int_c \frac{dz}{z^2 - 1}$ along C the positively oriented circle $|z| = 1$.

C â¡ð¶ $|z| = 1$ â¡ø I¬è õ†ì ðKFJ™ ªêò™ð´‹ õ†ì‹ âQ™ $\int_c \frac{dz}{z^2 - 1}$ ñFŠ¹ è£‡è.

SECTION C (5 x 12 = 60 marks)

16. (a) Explain Stereographic projection.
v®K«ò£Aó£H, iö™ MõK.

(or)

(b) Prove that $|Z_1 - Z_2| \geq |Z_1| + |Z_2|$
$|Z_1 - Z_2| \geq |Z_1| + |Z_2|$ âù GÁ¾è.

17. (a) State and Prove C-R equation in polar Co-ordinates.
«ð£ô£˜ Ýòˆ C-R ªî£¬ôJ™ êñ¡ð£†¬ì ÃP GÁ¾è.

(or)

(b) Show that (i) $\left(\frac{\delta^2}{\delta x^2} + \frac{\delta^2}{\delta y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ (ii) $\left(\frac{\delta^2}{\delta x^2} + \frac{\delta^2}{\delta y^2}\right)\log|f'(z)| = 0$

(i) $\left(\frac{\delta^2}{\delta x^2}+\frac{\delta^2}{\delta y^2}\right)\left|f(z)\right|^2 = 4\left|f'(z)\right|^2$ (ii) $\left(\frac{\delta^2}{\delta x^2}+\frac{\delta^2}{\delta y^2}\right)\log\left|f'(z)\right| = 0$ âù GÁ¾è.

18. (a) (i) State and Prove the uniqueness theorem for representation of a function by a power series.

(ii) Prove that $e^{z_1}.e^{z_2} = e^{z_1+z_2}$

(i) å¼ ê£˜¬ð Ü´,º ªî£ìó£è â¿¶õ¶ å«ó å ¼ õNJ™ ñ†´‹ º®»‹ â¡ð¬î GÁ¾è.

(ii) $e^{z_1}.e^{z_2} = e^{z_1+z_2}$ âù GÁ¾è.

(or)

(b) Discuss the logarithmic function.

ñì,¬è ê£˜¬ð MõK.

19. (a) If f(Z) is analytic in a region D and if f'(Z) $\neq$ 0 in D then prove that the mapping $w = f(Z)$

conformal in D.

D â¡ø Üóƒè^F™ f(Z) å¼ ðº¬ø„ ê£˜ð£è¾‹ f'(Z) $\neq$ 0 âù¾‹ Þ¼‰î£™ $w = f(Z)$ â¡ø à¼ñ£Ÿø‹ D ™ å^î à¼õº¬ìò¶ âù GÁ¾è.

(or)

(b) Discuss the transformation $w = \frac{1}{2}\left(z+\frac{1}{2}\right)$.

$w = \frac{1}{2}\left(z+\frac{1}{2}\right)$ â¡ø à¼ñ£Ÿø^¬î MõK.

20. (a) State and Prove the Cauchy's theorem using Goursat lemma.

ºê£†®¡ ¶¬í, «è£†ð£†®¬ù ðò¡ð´^F «è£CJ¡ «îŸø^¬î â¿F GÏH.

(or)

(b) State and Prove the Morera's theorem .

«ñ£Kò£v «îŸø^¬î ÃP GÁ¾è.

MODERN ALGEBRA -I

Time : 3 Hours Maximum : 100 Marks

SECTION – A **(10 X 1 = 10)**

1. G is a group and a ,b $\in$ G. The solution of ya = b is _____.
G - ´Õ ìÄõ a ,b $\in$ G, ya = b -ý ¾£÷× _____

2. If a*b = a^2+b^2 then find 2*3.
a*b = a^2+b^2 ±ýÈ¡ø 2*3 ¸¡ñ¸

3. Number of generators of a cyclic group of order n is _____.
n-ÅÃ¢¨º ¯ ¨¼Â ´Õ Åð¼ì ìÄò¾¢ý À¢ÈôÀì¸¢¸Ç¢ý ±ñ½¢ì¨¸_____.

4. If H is a subgroup of G and O(G) = 21 then find O(H).
H ±ýÀÐ G -ý ¯ðìÄõO(G) = 21 ±É¢ø O(H) ¸¡ñ¸

5. If G is a group and f(x)=e for all $x \in G$ then kerf=?.
G ´Õ ÌÄõ ÁüÚõ ±øÄ¡ $x \in G$ ìÌõ f(x)=e ±É¢ø kerf=?

6. The index of An in Sn is _____.
Sn-ø An -ý «ÎìÌì ÌÈ¢ ±ñ_____

7. If . is the multiplication mod 7 then $\bar{5}.\bar{4}$ = _____.
. ±ýÀÐ ¦ÀÕì¸ø ÁðÎ 7 ¬É¡ø $\bar{5}.\bar{4}$ ±ýÀÐ _____

8. If the non zero elements of a ring R form a group under multiplication then R is called _____.
Å¨ÇÂõ R-ø âîº¢ÂÁüÈ ¯ÚôÒ¸û ¦ÀÕì¸Ä¢ý ¸£ú ÌÄÁ¡¸ «¨Áó¾¡ø
R-ý ¦ÀÂ÷_____

9. Find the zero element of the ring RIU.
Å¨ÇÂõ RIU -ý âîº¢Â ¯ÚôÒ ¸¡ñ¸

10. $[a_1 b] + [c, d] = ?$ $[a_1 b]+ [c, d] = ?$.
$[a_1 b] + [c, d] = ?$ $[a_1 b]+ [c, d] = ?$.

SECTION – B **(5 X 6 = 30)**

11. (a) Let $\sigma : S \to T$ and $\tau : T \to U$. Prove that $\sigma o \tau$ is 1-1 if each of σ and τ is 1-1. Is the Converse true? Justify.
$\sigma : S \to T$ ÁüÚõ $\tau : T \to U$. σ ÁüÚõ τ ±ý¸. ´ù¦Å¡ýÚõ 1-1 ±É¢ø
$\sigma o \tau$ õ 1-1±É ¿¢Ú×¸. þ¾ý ÁÚ¾¨Ä ¯ñ¨ÁÂ¡? ¸¡Ã½õ ¾Õ¸.

(OR)

(b) If every element of the group G is its own inverse show that G is abelian.
ÌÄõ G-ø ´ù¦Å¡Õ ¯ÚôÀ¢üÌõ «Ð§Å ¾¨Ä¸£Æ¡¸ þÕó¾¡ø G ´Õ
«À£Ä¢Âý ±Éì ¸¡ðÎ¸.

12. (a) Prove that a subgroup of a cyclic group is cyclic.
´Õ Åð¼ì ÌÄò¾¢ý ¯ðÌÄÓõ ´Õ Åð¼ì ÌÄ§Á ±É ¿¢åÀ¢ì¸

(OR)

(b) If G is a group and H is a subgroup of index 2 in G prove that H is a normal subgroup of G.
G ´Õ ÌÄõ ÁüÚõ Gø 2 «ÎìÌ ¯ðÌÄõ H ¬Ìõ ±É¢ø G ìÌ H ´Õ
§¿÷¨Á ¯ðÌÄõ ±É ¿¢Ú×¸.

13. (a) Prove that a homomorphism ϕ of G into $\bar{G}$ with kernel K_ϕ is an isomorphism if and only if $K_\phi = \{e\}$.
G Â¢Ä¢ÕóÐ $\bar{G}$ ìÌ ϕ ´Õ ¦ºÂø Á¡È¡ì §¸¡÷ò¾ø; K_ϕ «¾ý ¯ð¸Õϕ
´Õ þÂø Á¡È¡ì §¸¡÷ò¾Ä¡¸ þÕì¸ò §¾¨ÅÂ¡ÉÐõ §À¡ÐÁ¡ÉÐÁ¡É
¿¢Àó¾¨É $K_\phi = \{e\}$.

(OR)

(b) If G is an infinite cyclic group. Prove that A(G) ≈ Cyclic group of order '2'.
G ±ýÀÐ ÓÊ×È¡ Åð¼ÌÄõ ±É¢ø A(G) ≈ ÅÃ¢¨º '2' ¯ûÇ Åð¼ÌÄõ ±É ¿¢Ú×¸

14. (a) Prove that every finite integral domain is a field.
±ó¾¦Å¡Õ ÓÊ×Ú ±ñ «Ãí¸Óõ ´Õ ¸Ç¦ÁÉ ¿¢åÀ¢ì¸

(OR)

(b) Let R be a ring. Let a,b,c,d ϵ R. Evaluate (a+b) (c+d) and $(a+b)^2$.
R ±ýÈ Å¨ÇÂò¾¢ý ¯ ÚôÒ¸û a,b,c,d ϵ R ±É¢ø (a+b) ,(c+d) , $(a+b)^2$.
¬¸¢ÂÅü¨Èì ¸¡ñ¸

15. (a) Show that the ideal U = (n_o) in the ring of integers is maximal $\Leftrightarrow$ n_o is a prime number.
ÓØ ±ñ¸û Å¨ÇÂò¾¢ø U = (n_o) ±ýÈ º£÷ Å¨ÇÂõ Á£ô¦ÀÕ º£÷ Å¨ÇÂõ
±ýÈ¡ø ÁðÎ§Á n_o ±ýÀÐ ´Õ À¸¡ ±ñ ±Éì ¸¡ðÎ¸.

(OR)

(b) If U is an ideal of R prove that the ring R/U is a homomorphic image of R.
R ìÌ U ¬ÉÐ ´Õ º£Ã¢Â Å¨ÇÂõ ±É¢ø Å¨ÇÂõ R/U ¬ÉÐ Rý
¦ºÂø Á¡È¡ì §¸¡÷ò¾ø À¢õÀõ ¬Ìõ ±É ¿¢Ú×¸.

SECTION – C **(5 X 12 = 60)**

16. (a) If $\sigma : S \to T$, $\tau : T \to U$ and $\mu : U \to Y$ Prove that
(i) $(\sigma \, o \, \tau) \, o \, \mu = \sigma \, o \, (\tau \, o \, \mu)$
(ii) $(\sigma \, o \, \tau)$ is one to one if each of σ and τ is one to one.
(iii) $(\sigma \, o \, \tau)$ is onto if each of σ and τ is onto.

$\sigma : S \to T$, $\tau : T \to U$, $\mu : U \to Y$ ±É¢ø ¸£úì¸ñ¼Åü¨È ¿¢åÀ¢ì¸
(i) $(\sigma \, o \, \tau) \, o \, \mu = \sigma \, o \, (\tau \, o \, \mu)$
(ii) σ , τ þÃñÎõ ´ýÚì¦¸¡ýÈ¡É º¡÷Ò¸û ±É¢ø $(\sigma \, o \, \tau)$ ´ýÚì¦¸¡ýÈ¡É º¡÷§À.
(ii) σ , τ þÃñÎõ "onto" ±É¢ø $(\sigma \, o \, \tau)$ õ onto.

(OR)

(b) (i) In a group G the equations a:x = b and y.a=b have unique solutions for x and y in G. Prove this.
(ii) If in a group $(a.b)^i = a^i . b^i$ for three consecutive integers I show that G is abelian.
(i) ÌÄõ G ø a:x = b ÁüÚõ y.a=b ìÌ x ÁüÚõ y ìÌ G ø ´§Ã ´Õ ¾£÷× ÁðÎõ ¯ ñÎ ±É ¿¢Ú×¸.
(ii) ´Õ ÌÄò¾¢ø «Îò¾Îò¾ ãýÚ ÓØ ±ñ¸û i ìÌ $(a.b)^i = a^i . b^i$ ±É¢ø G ´Õ «À£Ä¢Âý ±Éì ¸¡ðÎ¸.

17. (a) (i) If O(G) = P, a prime number, prove that G is a cyclic group.
(ii) Show that the intersection of two normal subgroups of G is a normal subgroup of G.
(i) O(G) = P (P ´Õ À¸¡ ±ñ) ±É¢ø ±ýÀÐ G ´Õ Åð¼ì ÌÄõ ±É ¿¢åÀ¢.
(ii) þÃñÎ §¿÷¨Á ¯ ðÌÄí¸Ç¢ý ¦ÅðÎì ¸½õ G ±ýÈ ÌÄò¾¢ý. §¿÷¨Á ¯ ðÌÄÁ¡Ìõ ±Éì ¸¡ðÎ¸.

(OR)

(b) Let H and K be two subgroup of a group G. Define HK. Give an example to show that HK need not be a subgroup of G. Prove that HK is a subgroup if and only if HK = KH.
H,K ±ýÀ¨Å¸û G ±ýÈ ÌÄò¾¢ý ¯ ðÌÄí¸û. HK-³ Å¨ÃÂÚì¸.

HK ´Õ ¯ðÌÄÁ¡¸¾Å¡Ú ´Õ ¯ ¾¡Ã½õ ¾Õ¸. HK ´Õ ¯ðÌÄÁ¡É¡ø
ÁðÎ§Á HK = KH ±É «¨ÁÔõ ±É ¿¢Ú×¸.

18. (a) State and Prove the fundamental theorem of homomorphism of groups.
ÌÄí¸ÙÌ¸¡É ¦ºÂø Á¡È¡ì §¸¡÷ò¾Ä¢ý «ÊôÀ¨¼ §¾üÈò¨¾ì
ÜÈ¢ ¿¢Ú×¸.

(OR)

(b) Prove that any non abelian group of order 6 is isomorphic to S_3.
ÅÃ¢¨º 6 ¦¸¡ñ¼ ±ó¾ ´Õ «À£Ä¢Âý «øÄ¡¾ ãÄÓõ S_3 ¯¼ý
´Õ þÂøÁ¡È¡ì §¸¡÷ò¾ø ¦¸¡ñÊÕìÌõ ±É ¿¢Ú×¸.

19 (a) (i) Show that $\tau(\sqrt{2}) = \{a + b\sqrt{2}/a,\ b\ \varepsilon\ J\}$ is a commutative ring with identity under usual addition and multiplication of real number. Here J is the set of integers.

(ii) If f is a field, Prove its only ideals are (o) and F itself.

(i) ÅÆì¸Á¡É Üð¼ø, ¦ÀÕì¸ø ¦ºÂø¸ÙìÌ $\tau(\sqrt{2}) = \{a + b\sqrt{2}/a,\ b\ \varepsilon\ J\}$
±ýÈ ¸½õ «ÄÌ ¯ ÚôÒì ¦¸¡ñ¼ ´Õ ÀÃ¢Á¡üÚ Å¨ÇÂõ ±É
¿¢Ú×¸. þíÌ J ±ýÀÐ ÓØ¦Åñ¸Ç¢ý ¸½õ.

(ii) F ±ýÀÐ ´Õ ¸Ç¦ÁÉ¢ø (0) ÁüÚõ F ÁðÎ§Á F-ý º£÷
Å¨ÇÂí¸Ç¡Ìõ ±É ¿¢åÀ¢.

(OR)

(b) Write a short note on real quarternions.
¦Áö ÌÅ¡÷ËÉ¢Âý ÀüÈ¢ º¢Ú ÌÈ¢ôÒ Å¨Ã¸.

20 (a) Prove that an ideal M of a commutative ring R with unit element is maximal $\Leftrightarrow$ R/M is a field.
R ±ýÀÐ «ÄÌ ¯ ÚôÒ ¦¸¡ñ¼ ´Õ ÀÃ¢Á¡üÚ Å¨ÇÂõ. R-ý º£÷
Å¨ÇÂõ M ¬ÉÐ Á£ô¦ÀÕ º£÷ Å¨ÇÂõ $\Leftrightarrow$ R/M ´Õ ¸Çõ ±É ¿¢Ú×¸.

(OR)

(b) Prove that every integral domain can be imbedded in field.
´ù¦Å¡Õ ±ñ «Ãí¸ò¨¾Ôõ ´Õ ¸Çò¾¢ø À¾¢ì¸ÓÊÔõ ±É ¿¢Ú×¸.

Real Analysis - II

Time: Three hours Maximum Marks: 100 marks

Answer all questions

SECTION A (10 x1 =10 marks)

1. A metric space S is connected if every two valued function on S is ----------
S -™ åšªõ£¼ Þó†¬ì ñFŠ¹ ê£˜¹‹ -------- âQ™ ªñ†K, ê£˜¹ S ªî£´ˆîî£‰.
2. Every open interval in R is ----------
R -™ àœ÷ åšªõ£¼ Fø‰î ªõO»‹ ----------

3. (0,1) U (2,3) is ----------
(0,1) U (2,3) â¡ð¶
4. Uniform continuity on a set A implies ---------- on A.
èí‹ A-¡ Yó£ù ªî£Ì˜¹ A-™ ---------- Ꭾ,‰

5. If f is differentiable at C, then f is ---------- at C.
   C -™ õ¬èJìˆî,è¶ âQ™ f™ â¡ð¶ ----------.
6. If f(x) = (x-a)(b-x) ; a ≤ x ≤ b, then find the value of C in Rolles' theorem is ----------
   --
f(x) = (x-a)(b-x) ; a≤ x ≤ b, âÂ‹ âQ™ «ó£L¡ «îŸøˆF™ C¡ ñFŠ¹ è£‡è.
7. If $V_f(a,b)=0$, then f is ---------- on [a,b].
   $V_f(a,b)=0$ âQ™, f â¡ð¶ [a,b] ----------.
8. The set of polynomial functions with integer coefficients is ……
ñ£P ¶ƒè¬÷ ªè£‡ì ð™½ÁŠ¹ ê£˜¹èO¡ èí‹ --------- - Ý°.
9. If P' is finer than P , then ----------
   P' â¡ð¶ ðƒA´ Pä Mì ªîO¾ð´ˆîŠð†ìî£è Þ¼ŠðîŸ°--------- ----------
10. In Riemann – Stieltjes integral, a remarkable connection exists between the integrand and the -----
   gñ£¡-v®™ªüv ªî£¬èJ™,ªî£¬èè£í½,° ----------Þ¬ì«ò å˜ ¶ŠHìˆî,è ªî£ì˜¹ «î£¡Á‹.

SECTION B (5 x 6 = 30 marks)

11. (a) Let f: S $\rightarrow$ T be a function from (s,ds) to (T,dt) . If f is continuous on a compact subset X of S,
   Prove that f(x) is a compact subset of T.
f: S $\rightarrow$ T â¡ð¶ (s,ds) L¼‰¶ (T,dt) õ¬ó õ¬óòÁ,èŠð†´œ÷¶. S¡ à†èí‹ X™ f â¡ð¶ ªî£ì˜„Cò£è Þ¼,AøªîQ™ f(x) Ýù¶ T¡ è†Cîñ£ù à†èíñ£è Þ¼,° âù GÁ¾è.

(or)

   (b) State and prove Bolzano Weierstrass theorem.
   «ð£™ê£«ù£ Mò˜v†óR¡ «îŸøˆ¬î ÃP GÁ¾è.
12. (a) If every two valued function S is constant then a metric space S is connected .
   S -™ åšªõ£¼ Þó†¬ì ñFŠ¹ ê£˜¹‹ ñ£PL âQ™ S ªî£´ˆî ªñ†K, ê£˜¹ ªõOò£°.

(or)

(b) If f: S$\rightarrow$ M be a function from a metric space S to another metric space M. Let X be a connected subset of S. IF f is continuous on X, then prove that f(x) is a connected subset of M.
   f: S$\rightarrow$ M â¡ð¶ ªñ†K,ªõO S L¼‰¶ ªñ†K,ªõO M õ¬ó õ¬óòÁ,èŠð†ì ê£˜¹
â¡è. S¡ ªî£ì˜¹¬ìò à†èí‹ X â¡è. X -™ f Ýù¶ ªî£ì˜„Cò£è Þ¼,ªñQ™ â¡ð¶
   M¡ ªî£ì˜¹¬ìò à†èí‹ âù GÁ¾è.
13. (a) State and prove Rolles' theorem.
   «ó£L¡ «îŸøˆ¬î ÃP GÁ¾è (or)
(b) If f and g are defined on (a,b) and differentiable at C then (f ± g)' (c) = f'(c) ± g'(c).
(a,b)- ™ õ¬óòÁ,èŠð†´, C-™ õ¬èJìˆî,è ê£˜¹èœ f ,g âQ™(f ± g)' (c) = f'(c) ± g'(c)
   âù GÁ¾è.

14. (a) If f and g are bounded variation on [a,b], show that $V_{f.g} \le AV_f + BV_g$ where
   A= sup$\{|g(x)| : x \in [a,b]\}$, B= sup$\{|f(x)| : x \in [a,b]\}$
   (a,b)- ™ f ,g â¡ðù õó‹¹¬ìò ñ£Ÿø‹ àœ÷¶ âQ™ $V_{f.g} \le AV_f + BV_g$ âù è£†´è.Þƒ° A= ªð¼ñ‹ $\{|g(x)| : x \in [a,b]\}$, B= ªð¼ñ‹ $\{|f(x)| : x \in [a,b]\}$ (or)
   (b) If f is monotonic on [a,b], prove that the set of discontinuities of f is countable.

[a,b]- ™ f â¡ð¶ åKò™¹ ê£˜¹ âQ™ f¡ ªî£ì˜„CòŸø ¹œOèO¡ èí‹ â‡Eì˜î,èî£è Ü¬ñ»‹ âù GÁ¾è.

15. (a) Prove that : $\int_a^b fd(C_1\alpha + C_1\beta) = C_1\int_a^b fd\alpha + C_2\int_a^b fd\beta$

GÁ¾è: $\int_a^b fd(C_1\alpha + C_1\beta) = C_1\int_a^b fd\alpha + C_2\int_a^b fd\beta$ (or)

(b) If $f \in R(\alpha) and f \in R(\beta)$ on [a,b], prove that $f \in R(C_1\alpha + C_2\beta)$

[a,b]- ™ $f \in R(\alpha)$, $f \in R(\beta)$ âQ™ [a,b]- ™ $f \in R(C_1\alpha + C_2\beta)$ âù GÁ¾è.

SECTION C (5 x 12 = 60 marks)

16. (a) If f: S $\rightarrow$ T be a function from (s,ds) to (T,dt) . Show that f is continuous on S if and only if

f or every open set Y in T, f^{-1}(-y) is open in S.

f: S $\rightarrow$ T â¡ø (s,ds) L¼‰¶ (T,dt) õ¬ó õ¬óòÁ,èŠð†´œ÷¶. âQ™ S¡ f Ýù¶ ªî£ì˜„Cò£è Þ¼,è «î¬õò£ù,«ð£¶ñ£ù Gð‰î¬ù, T™ àœ÷ åšªõ£¼ Fø‰î à†èí‹ Y ,° Ýù¶ f^{-1}(-y)™ Fø‰î èíñ£è Þ¼,° âù, è£†´è.

(or)

(b) If f: S $\rightarrow$ M, if X be a connected subset of S and if f is continuous on X, then f(X) is a connected subset of M.

f: S $\rightarrow$ M ™, S-¡ ªî£´ˆî à†èí‹ X âù¾‹ «ñ½‹ X™ f ªî£ì˜ ê£Šªðù¾‹ Þ¼,è, M¡ ªî£´ˆî à†èí‹ f(X) âù GÁ¾è.

17. (a) Prove that every open connected set in R^n is arcwise connected.

R^n ™ àœ÷ åšªõ£¼ Fø‰î ªî£ì˜¹¬ìò èíº‹ M™õN ªî£ì˜¹¬ìò¶ âù GÁ¾è.

(or)

(b) Let f' takes only positive values in (a,b), then f is strictly increasing on [a,b].

(a,b) ™ f'-Ÿ,°I¬è ñFŠ¹èœ ñ†´‹ à‡´ âQ ™ [a,b]™ è‡®Šð£è Ã´‹ ê£˜ð£°.

18. (a) if f and g are contuious on [a,b] and have and equal finite derivatives in [a,b]then f-g is constant on [a,b].

[a,b] ™ , f ,g ªî£ì˜ ê£˜¹èœ âù¾‹, «ñ½‹ [a,b]™ êñ º®¾Á õ¬èè¬÷ ªè£‡ì¬õèœ âQ™ [a,b]™ ñ£PL f-g âù GÁ¾è.

(or)

(b) State and prove intermediate value theorem for derivatives.

õ¬èfì½,è£è Þ¬ìñFŠ¹ «îŸøˆ¬î ÃP GÁ¾è.

19. (a) Let f be of bounded variation on [a,b]. if x $\in$ [a,b], let V(x) = V_f(a,x) and V(a)=0 . Then prove that

every point of continuity of f is also a point of continuity of V. Also prove that the converse is also

true.

[a,b] ™, f â¡ð¶ õó‹¹ ñ£Ÿø‹ à¬ìò¶, x $\in$ [a,b]™ V(x) = V_f(a,x) ñŸÁ‹ V(a)=0 â¡è. f ,° ªî£ì˜„Cò£è àœ÷ åšªõ£¼ ¹œO»‹ V ,°ªî£ì˜„Cò£è Þ ¼,° âù¾‹ Þî¡ ñÁî¬ô GÁ¾è.

(or)

(b) Let f be of bounded variation on [a,b]. if c ∈ [a,b], then prove that f is bounded variation on [a,c]

and on [c,b] and $V_f(a,b) = V_f(a,c) + V_f(c,b)$

[a,b] ™, f â¡ð¶ õó‹¹ ñ£Ÿø‹ à¬ìò¶, c ∈ [a,b]™ âQ™ [a,c] ñŸÁ‹ [c,b] ™, f â¡ð¶ õó‹¹ ñ£Ÿø‹ à¬ìò¶. âù¾‹ $V_f(a,b) = V_f(a,c) + V_f(c,b)$ âù¾‹ GÁ¾è.

20. (a) If f∈ R(α) on [a,b], show that α∈ R(f) on [a,b] and

$$\int_a^b f(x)d\alpha x + \int_a^b \alpha(x)dfx = f(b)\alpha(b) - f(a)\alpha(a)$$

[a,b] ™, f∈ R(α)âQ™ [a,b] ™α∈ R(f) ñŸÁ‹ $\int_a^b f(x)d\alpha x + \int_a^b \alpha(x)dfx = f(b)\alpha(b) - f(a)\alpha(a)$ âù è£†´è.

(or)

(b) Assume f∈ R(α) on [a,b] and α has continuous derivative α' on [a,b] . Show that

$$\int_a^b f(x)\alpha'(x)dx$$

exists and $\int_a^b f(x)d\alpha x = \int_a^b f(x)\alpha'(x)$

[a,b] ™, f∈ R(α) ñŸÁ‹ [a,b] ™ α ,°ªî£ì˜„Cò£ù õ¬èfì™ α' àœ÷¶ âQ™ $\int_a^b f(x)\alpha'(x)dx$

Þ¼,‰ âù¾‹ ñŸÁ‹ $\int_a^b f(x)d\alpha x = \int_a^b f(x)\alpha'(x)$ âù¾‹ è£†´è.

COMPLEX ANANLYSIS - II

Time: Three hours Maximum Marks: 100 marks

Answer all questions

SECTION A (10 x1 =10 marks)

1. Find the value of the integral $\int_c (z^2 - 2z - 3)dz$ where C is the circle $|Z| = 3$

   C â¡ð¶ $|Z| = 3$ âÂ‹ õ†ì‹ âQ™ $\int_c (z^2 - 2z - 3)dz$ - ¡ ñFŠ¹ è£‡è.

2. If f(Z) is analytic inside and SCR curve C, then the maximum value occurs at-------
   ----

   f(Z) Ýù¶ âOò ªî£ì˜¹¬ìò ðŒJ™ Ü¬ì,èŠð†ì õ¬÷õ¬ ó C-™ ðº¬ø„ ê£˜¹ âQ™ Üîì eŠªð¼ ñFŠ¹ ----------™ A¬ì,°.

3. The region of validity for the function log(1-Z) is ----------
   log(1-Z) - â¡ø ê£˜H¡ ãŸÁ, ªè£‡ì ðŒ---- ----------

4. Find the value of $\int_c \frac{dz}{(z^2 + 2z + 2)}$ where C is the circle $|Z| = 1$

   C â¡ð¶ $|Z| = 1$ â¡Â‹ õ†ì‹ âQ™ $\int_c \frac{dz}{(z^2 + 2z + 2)}$ ¡ ñFŠ¹ è£‡è.

5. Find Singular points of f(z) = $\frac{1}{z(z-1)}$.

   f(z) = $\frac{1}{z(z-1)}$ - â¡ø ê£˜H¡ CøŠ¹ ¹œOèœ è£‡è.

6. The residue of $\frac{(5z-2)}{(z^2 - z)}$ at z=1 is ------

   $\frac{(5z-2)}{(z^2 - z)}$,°z=1 -™ â„ê ñFŠ¹ --------- Ý°.

7. An analytic function in the extended plane is ----------
   MKêñ î÷ˆF™ å¼ ðº¬ø„ ê£˜¹ ----------

8. By using residue theorem. Find $\int_c \phi(z)dz$ = ----------

   â„ê «îŸøˆ¬î ðò¡ð´ˆF, $\int_c \phi(z)dz$ = ----------

9. A function which is meromorphic in the extended plane is ----------
   MK¾Šð´ˆîŠð†ì î÷ˆF™ å¼ ê£˜¹ ªñ£«ó£ñ£˜H, ê£˜ð£è Þ¼,ªñQ¡ ----------

10. Write the value of Δ_c arg f(z)----------

    Δ_c arg f(z)¡ ñFŠ¹ è£‡è.

SECTION B (5 x 6 = 30 marks)

11. (a) State and prove Liouville's theorem .
L«ò£M™hv «îŸøˆ¬î ÃP GÁ¾è.

(or)

(b) State and prove the fundamental theorem of Algebra .
ÞòŸèEîˆF¡ Ü®Šð¬ìˆ «îŸøˆ¬î ÃP GÁ¾è.

12. (a) State and prove uniqueness theorem on Taylor's series.
ªìŒô˜ ªî£ìK¡ å¼¬ñˆ î¡¬ñ «îŸøˆ¬î ÃP GÁ¾è.

(or)

(b) If C is the positively oriented circle $|t-i|=2$, show that I= $=\int_c \frac{1}{(t^2+4)^2}$ dt = $\frac{\pi}{16}$.

C â¡ð¶ å¼ º¿¬ñò£ù õ†ì‹ $|t-i|=2$ âQ™ I= $=\int_c \frac{1}{(t^2+4)^2}$ dt = $\frac{\pi}{16}$ âù GÁ¾è.

13. (a) Find the residue of f(z) = $\frac{z^2}{(z-1)^2(z+2)}$ at each of the poles.

f(z) = $\frac{z^2}{(z-1)^2(z+2)}$ â¡Â‹ ê£˜H¡ â„êˆ¬î Üî¡ ¶¼õŠ¹œOJ™ è£‡.

(or)

(b) Define removable singularity. Give an example.
c,èŠð†ì CøŠ¹ ¹œO¬ò õ¬óòÁˆ¶ â´ˆ¶,è£†´ì¡ M÷,'è.

14. (a) Show that $\int_0^{2\pi} \frac{d\theta}{a+b\sin\theta} = \frac{2\pi}{\sqrt{a^2-b^2}}, a>|b|$

$\int_0^{2\pi} \frac{d\theta}{a+b\sin\theta} = \frac{2\pi}{\sqrt{a^2-b^2}}, a>|b|$ âù GÁ¾è.

(or)

(b) Evaluate $\int_0^{\infty} \frac{dx}{(x^2-1\ )^2}$

ñFŠH´è. $\int_0^{\infty} \frac{dx}{(x^2-1\ )^2}$

15 (a) State and prove the fundamental theorem of algebra by using Rouche's theorem.
«ó£„ê˜v «îŸøˆ¬î ðò¡ð´ˆF ÞòŸèEîˆF¡ Ü®Šð¬ìˆ «îŸøˆ¬î ÃP GÁ¾è.

(or)

(b) Use Rouche's theorem to show that the equation $z^2+15z+1=0$ has one root in the disc $|z|<\frac{3}{2}$ and four roots in the annulus $\frac{3}{2}<|z|<2$

«ó£„ê˜v «îŸøˆ¬î ðò¡ð´ˆF $z^2+15z+1=0$ â¡ø êñ¡ð£†®¡ å¼ Íô‹ $|z|<\frac{3}{2}$ â¡ø

õ†ì^F½‹ ñŸÁ‹ ï£¡°Íôƒèœ $\frac{3}{2} < |z| < 2$ â¡ø ÝµôRv Ü¬ñ»‹ âù GÁ¾è.

SECTION C (5 x 12 = 60 marks)

16.(a) State and prove Cauchy's theorem.
«è£S «îŸø^¬î ÃP GÁ¾è.

(or)

(b) State and prove Maximum modulus theorem.
à„ê ºè î^¶õ‹ «îŸø^¬î ÃP GÁ¾è.

17.(a) State and Prove Taylor's series.
ªìŒôK¡ ªî£ì¬ó, ÃP GÁ¾è. (or)

(b) Expand f(z) = $\frac{1}{(z-1)(z-2)}$ in Lawrents series if (i) $|Z| < 1$ (ii) $|Z| > 2$ (iii) $1 < |Z| < 2$

(i) $|Z| < 1$ (ii) $|Z| > 2$ (iii) $1 < |Z| < 2$ âQ™ f(z) = $\frac{1}{(z-1)(z-2)}$ ä ô£ó¡v ªî£ìó£è â¿¶.

18. (a) State and Prove Cauchy's Residue theorem.
«è£S â„ê^ «îŸø^¬î ÃP GÁ¾è.

(or)

(b) (i) Define removable singularity and essential singularity.

(ii) Find the residue f(z) = $\frac{\sin z}{z \cos z}$

(i) M´Šð†ì îQ^î¡¬ñ ñŸÁ‹ «î¬õò£ù îQ^î¡¬ñè¬÷ õ¬óòÁ.

(ii) f(z) = $\frac{\sin z}{z \cos z}$ âÂ‹ ê£˜H¡ â„ê^¬î, è£‡è.

19. (a) Prove that $\int_0^\infty \frac{x^2 dx}{(x^2+4)^2 (x^2+9)} = \frac{\pi}{200}$

$\int_0^\infty \frac{x^2 dx}{(x^2+4)^2 (x^2+9)} = \frac{\pi}{200}$ âù GÁ¾è.

(or)

(b) Evaluate $\int_0^\infty \frac{\sin x dx}{x}$

$\int_0^\infty \frac{\sin x dx}{x}$ ä èí,A´è.

20. (a) Prove that a function which is memorable c in the extended plane is a rational function.

ªñ«ó£ñ£˜H, ê£˜¹ å¼ MK‰î î÷ˆF™ MAîºÁ ê£˜ð£è Ü¬ñ»‹

(or)

(b) If a>e, use Roucher's theorem to prove that equation $e^z = az^n$ has n roots inside the circle $|z| = 1$.

a>e âQ™ $e^z = az^n$ â¡ø êñ¡ð£´ $|z| = 1$ âÂ‹ õ†ìˆF™ n Íôè*f*è¬÷ ªè£´,ˆ «ó£„êˆv «îŸøˆ¬î ðò¡ð´ˆF GÁ¾è.

Modern Algebra - II

Time: Three hours Maximum Marks: 100 marks

Answer all questions

SECTION A (10 x1 =10 marks)

1. If $\begin{bmatrix} 1 & 3 & 4 \\ 2 & 4 & 6 \\ 1 & -1 & 0 \end{bmatrix} + B = \begin{bmatrix} 2 & 2 & 0 \\ 1 & -2 & 1 \\ 3 & 4 & 2 \end{bmatrix}$ then find B.

   $\begin{bmatrix} 1 & 3 & 4 \\ 2 & 4 & 6 \\ 1 & -1 & 0 \end{bmatrix} + B = \begin{bmatrix} 2 & 2 & 0 \\ 1 & -2 & 1 \\ 3 & 4 & 2 \end{bmatrix}$ âQ™ B¬ò è£‡è.

2. Find all diagonal elements of a hermitian matrix
   å¼ ªý˜eSò¡ ÜEJ¡ Í¬ôM†ì àÁŠ¹èœ Ü¬ùˆ¶‹ è£‡è.

3. Find the inverse of $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ is

   $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$-M¡ «ï˜ñ£Á àÁŠ¹ è£‡è.

3. Find the rank of the matrix $\begin{bmatrix} -1 & 0 & 2 \\ 1 & 1 & -1 \\ 0 & 0 & -1 \end{bmatrix}$

   $\begin{bmatrix} -1 & 0 & 2 \\ 1 & 1 & -1 \\ 0 & 0 & -1 \end{bmatrix}$ â¡ø ÜEJ¡ îó‹ è£‡è.

4. If S and T are subsets of a vector spaceV_1T L(SUT)-L(S) is ----------

S ñŸÁ‹ T â¡ðù V_1T â¡ø ªõ,ì˜ ªõOJ¡ à†èíƒèœ âQ™ L(SUT)-L(S) â¡ð¶ ------

5. If dim A- dim B =10 , dim (A$\cap$B) then dim(A+B) is ----------
   dim A- dim B =10 , dim (A$\cap$B) âQ™ dim(A+B) â¡ð¶ ---------

7. The value of $(\alpha u, \beta u)$ is ----------
   $(\alpha u, \beta u)$-¡ ñFŠ¹ ----------

8. $\cup\cap_7$ $(\alpha_1 \cup_1 + \alpha_2 \cup_2 + ... + \alpha_n \cup_n) =$ ----------
   $\cup\cap_7$ $(\alpha_1 \cup_1 + \alpha_2 \cup_2 + ... + \alpha_n \cup_n) =$ ----------

9. If UT = λ U then UT^4 is ----------
   UT = λ U âQ™ UT^4 â¡ð¶ ----------

10. A linear transformation is an element of ----------
    å˜ å¼ð® ñ£Ÿø‹ ----------J¡ å˜ àÁŠ¹.

SECTION B (5 x 6 = 30 marks)

11. (a) Find $(A+2B)^2$ where

$$A=\begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -4 & 9 & 5 \end{bmatrix} \quad B=\begin{bmatrix} 1 & 2 & -1 \\ -2 & -1 & 2 \\ 1 & -3 & -1 \end{bmatrix}$$

«ñ«ô àœ÷ A,B â¡ø ÜEèÀ,° $(A+2B)^2$ ä, è‡´H®.

(or)

(b) Define a symmetric matrix. Give an example of a matrix which is symmetric matrices A and B that AB is not symmetric.
êñ„Y˜ ÜE¬ò õ¬óòÁˆ¶ àî£óí‹ î¼è. A ,B â¡ø ÜEèœ êñ„Yó£è¾‹, AB êñ„Yó£è£ñ£™ õ¼‹ð® â¡ø A ,B Þ¼ ÜEè¬÷, è‡´H®.

12. (a) Define a unitary matrix. Show that the matrix $\frac{1}{5}\begin{bmatrix} -1+2i & -4-2i \\ 2-4i & -2-i \end{bmatrix}$ is unitary.

åŸ¬øò£ù ÜE¬ò õ¬óòÁ,è $\frac{1}{5}\begin{bmatrix} -1+2i & -4-2i \\ 2-4i & -2-i \end{bmatrix}$ â¡ø ÜE åŸ¬øò£ù ÜE âù è£†´è.

(or)

(b) Verify Cayley Hamilton theorem for A= $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and hence find A^n.

A= $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ â¡ø ÜE «ý£ŒL ý£I™ì¡ «îŸøˆ¬î êKð£˜,è. «ñ½‹ A^n ä, âù è£‡è.

13. (a) Show that the vectors (1,0,-1) , (2,1,3),(-1,0,0) and (1,0,1) are linearly dependent in R^3

(1,0,-1) , (2,1,3),(-1,0,0) ñŸÁ‹ (1,0,1) â¡ø ªõ,ì˜èœ R^3 Þ™ å¼ð®„ ê£˜‰î¬õ âù GÁ¾è.

(or)

(b) If $U_1, U_2, U_3, ...U_n$ are in V, then prove either they are linearly independent or some U_k linear combination of the preceding ones $U_1, U_2, U_3, ...U_k$

V â¡ø ªõ,ì˜ ªõOJ™ àœ÷ ªõ,ì˜èœ $U_1, U_2, U_3, ...U_n$ â¡ø£™ Ü¬õ å¼ð® ê£ó£ ªõ,ì˜è÷£è Þ¼‚ Ü™ô¶ ãî£õªî£¼ U_k ÜîŸ°‰¬îò ªõ,ì˜èO¡ $U_1, U_2, U_3, ...U_k$ å¼ð®„ «ê˜õ£è Þ¼‚ âù G¼H.

14. (a) Prove that L(s) is a subspace of V.

V- ¡ àœªõO L(s) âù GÁ¾è.

(or)

(b) State and prove the Schwarz inequality.

võ£˜S¡ êñ¡ð£†®¡¬ñ¬ò, ÃP GÁ¾è

15. (a) if V is finite dimensional over F , Prove that T∈ A(V) is invertible if and only if the constant term

of the minimal polynomial for T is not Zero.

F ¡ e¶ V å¼ º®¾Á ðKñ£í‹ ªè£‡ì ªõ,ì˜ ªõO, T∈ A(V) ,°âF˜ñ¬ø Þ¼‰î£™ ñ†´«ñ TJ¡ e„YÁ ð™½ÁŠ¹, «è£¬õJ¡ ñ£ø£, ‚ìè‹ Ì xò‹ Ü™ô âù GÁ¾è.

(or)

(b) Prove that T∈ A(V) is completely determined by its values on a basis of V.

V ¡ Ü®ñ£ùˆF™ T A(V) Üî¡ ñFŠ¹è÷£™ º¿¬ñò£ù õ¬óòÁ,èŠð´Aø¶ âù GÁ¾è.

SECTION C (5 x 12 = 60 marks)

16. (a) (i) For any square matrix A of order n, Prove that A(adj A) = (adj A) – (det A) I_n .

(ii) If A and B are symmetric, show that AB-BA is skew symmetric.

(i) n õK¬ê àœ÷ â‰î ÜE A,‚ A(adj A) = (adj A) – (det A) I_n âù GÁ¾è.

(ii) A ñŸÁ‹ B êñ„Y˜ âQ™ AB-BA âF˜ êñ„Y˜ âù è£†´è

(or)

(b) (i) Express A= $\begin{bmatrix} 2+3i & 1-i & 2+i \\ 3 & 4+3i & 5 \\ 1 & 1+i & 2i \end{bmatrix}$ as sum of a hamitian and skew hermitian matrix.

$\begin{bmatrix} 2+3i & 1-i & 2+i \\ 3 & 4+3i & 5 \\ 1 & 1+i & 2i \end{bmatrix}$ â¡ø ÜE¬ò å¼ ªý˜eêEò¡ å¼ âF˜ ªý˜eêEò¡ ÜEèO¡ Ã†ìô£è â¿¶è.

(ii) Prove that A= $\frac{1}{3}\begin{bmatrix} -1 & 2 & 3 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$ is orthogonal.

A=$\frac{1}{3}\begin{bmatrix} -1 & 2 & 3 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$ â¡ð¶ å¼ ªêƒ°¶ ÜE âù GÁ¾è.

17.(a) (i) Find the rank of $\begin{bmatrix} 1 & -1 & 0 & 2 & 1 \\ 3 & 1 & 1 & -1 & 2 \\ 4 & 0 & 1 & 0 & 3 \\ 9 & -1 & 2 & 3 & 7 \end{bmatrix}$ (ii) Find the Characteristic roots of the matrix

$\begin{bmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -3 \end{bmatrix}$ (i) $\begin{bmatrix} 1 & -1 & 0 & 2 & 1 \\ 3 & 1 & 1 & -1 & 2 \\ 4 & 0 & 1 & 0 & 3 \\ 9 & -1 & 2 & 3 & 7 \end{bmatrix}$ â¡ø ÜE¬ò îóˆ¬î, è£‡è.

(ii) $\begin{bmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -3 \end{bmatrix}$ â¡ø ÜEJ¡ CøŠHò™¹ Íôƒè¬÷ è‡´H®.

(or)

(b) Computer the transpose, adjoint and inverse of the matrix. $\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 1 & 0 & 1 \end{bmatrix}$

$\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 1 & 0 & 1 \end{bmatrix}$ â¡ø ÜEJ¡ ñ£ŸÁ ÜE,Þ¬í ÜE, «ï˜ñ£Á ÜE Þ¬õè¬÷, è‡´H®.

18. (a) If v is Finite dimensional over F, Prove any two bases of V have the same number of element.

F ¡ e¶ v å¼ º®¾Á ðKñ£í ªõO âQ™ ™ â‰î Þ¼ Ü®, èíƒèÀ‹ êñ â‡E,¬è à¬ìò àÁŠ¹è¬÷, ªè£‡®¼,˜ âù GÁ¾è.

(or)

(b) If v is Finite dimensional and if w is a subspace of V, prove that w is finite dimensional dim w ≤

dim v=dim w+ dim $\frac{v}{w}$.

v å¼ º®¾Á ðKñ£í ªõO ñŸÁ‹ w â¡ð¶ vJ¡ àœªõO âQ™ w å¼ º®¾Á ðKñ£íº¬ìò¶ â¡Á‹ dim w ≤ dim v â¡Á‹ ñŸÁ‹ dim v=dim w+ dim $\frac{v}{w}$ âù GÁ¾è

19. (a) If V and W are of dimensional m and n , respectively over F, prove that Hom(V,W) is dimension mn over F.

F ¡ e¶ ðKñ£í m ,n è¬÷ à¬ìò ªõ,ì˜ ªõOèœ V, W âQ™ F¡ e¶ Hom(V,W)¡ ðKñ£í‹ âù GÁ¾è.

(or)

(b) Let V be the set of all polynomials of degree $\leq$ 2.V is a real inner product space with the inner

product defined by $\langle f, g\rangle = \int_{-1}^{1} f(t)g(t)dt$. Starting with the basis $\{1, x, x^2\}$obtain the orthogonal basis for V.

V â¡ð¶ ‘2’ Ü™ô¶ ‘2’ ,°°¬øõ£ù ð®»¬ìò Ü¡ùˆ¶ ð™½ÁŠ¹ « ê˜,¬èèO¡ èí‹$\langle f, g\rangle \varepsilon$V âQ™

$\langle f, g\rangle = \int_{-1}^{1} f(t)g(t)dt$ âù õ¬óòÁ,èŠð´Šð†ì à†ªð¼,è½ì¡ Vå¼ à†èí‹ ªõO Ý°. $\{1, x, x^2\}$âÂ‹ Ü®,èíˆF™ Ýó‹Hˆ¶ å¼ ªêƒ°¶ Ü®,èí‹ è£‡è.

20. (a) If V is a finite dimensional inner product space and if w is a subset of V, prove that

(i) V =W+W $w^{\perp}$

(ii) w $\cap w^{\perp} = 0$ (ii) $(w^{\perp})^{\perp} = w$

V â¡ð¶ å¼ º®¾Á ðKñ£í‹ ªè£‡ì à†ªð¼,è™ ªõO ñŸÁ‹ W â¡ð¶ V¡ àœªõO âQ™

(i) V =W+W $w^{\perp}$ (ii) w $\cap w^{\perp} = 0$ (ii) $(w^{\perp})^{\perp} = w$ âù GÁ¾è.

(or)

(b) Let V be the vector space of polynomials of degree 3 or less over F. In V define T by $(\alpha_0 + \alpha_1 x + \alpha_2 x^2 + \alpha_3 x^3)T = \alpha_1 + 2\alpha_2 x + 3\alpha_3 x^2$ compute the matrix of T in the basis .

(i)1,x,x^2,x^3.

(ii) 1,1+x,1+x^2,1+x^3. (iii) if the matrix in part (i) is A and that in part (ii) is B , find a matrix such that

B=cAc^{-1}.

V â¡ð¶ ‘3’ Ü™ô¶ ‘3’ ,°°¬øõ£ù ð®»¬ìò Ü¡ùˆ¶ ð™½ÁŠ¹ « ê˜,¬èèO¡ èí‹ , V™ â¡ð¶ âí õ¬óòÁ,èŠð´Aø¶. T¡ ÜE¬ò W›,è‡ì Ü®,èíƒè¬÷ ªð£Pˆ¶, è£‡è.

(i)1,x,x^2,x^3.(ii) 1,1+x,1+x^2,1+x^3. (iii) ðŦ(i)™ õ¼‹ ÜE â¡Á‹ ðŦ(ii)™ õ¼‹ ÜE â¡Á‹ Þ¼‰î£™B=cAc^{-1}.âù õ¼‹ð® â¡ø ÜE¬ò, è£‡è.

AOS – Numerical Methods I

Time : 3 Hours Maximum : 100 Marks

Section – A (10 x 1 = 10 Marks)

Answer all Questions

(1) The equation $x^3 - 4x - 9 = 0$ will have a real root between ----------
$x^3 - 4x - 9 = 0$ vd;w rkd;ghL ///////////////// f;F ,ilapy; bka; K:yk; bfhz;oUf;Fk;/

(2) The order of convergence of Newton-Raphson method is .....
epa{l;ld;?uhg;rd; Kiwapd; RU';Fjy; thpir ////////////////// MFk;/

(3) Gauss elimination method is a ..... method.
fh!; ePf;Fjy; KiwahdJ xU ////////////////// KiwahFk;/

(4) The rate of covnergence of Gauss – Seidal method is roughly ..... that of Jawbi method.
fh!;?rPly; Kiwapd; RU';Fjy; tPjkhdJ n$fgp Kiwapd; xU';Fjiyg; nghy; njhuhakhf ////////////////// kl';fhFk;/

(5) Δ^2 is called the ..... order difference operator.
Δ^2 vd;gij ////////////////////// thpir tpj;jpahr brayp vd miHf;fpd;nwhk;/

(6) The central difference $\delta y_x =$ .....
kj;jpa tpj;jpahrk; $\delta y_x =$ ///////////////

(7) State Gauss's forward interpolatim formula
fh!pd; Kd;ndhf;F ,ilr;brUfy; Nj;jpuj;ij vGJf/

(8) State Stirling's formula
!;l;hpy;yp';!;rpd; Nj;jpuj;ij jUf/

(9) If f(x) = 1/x1 find the divided difference f(a,b) and f(a,b,c).

(10) Write the Lagrange's interpolation formula for unequal intervals.
rkkw;w ,ilbtspf;fhd byf;uh";rpad; ,ilr;brUfy; Nj;jpuj;ij vGJf/

Section B (5 x 6 = 30 Marks)

(11) (a) Obtain a root of $x^3 - x - 1 = 0$ using bi section method.
,Urk Twhf;fy; Kiwiag; gad;gLj;jp $x^3 - x - 1 = 0$ d; jPh;t[fhz;f/

(or)

(b) Describe the method of false position.
gpiHepiy Kiwapid tpthpf;ft[k;/

(12) (a) Solve by Gauss elimination method.

$$3x - y + 2z = 12$$
$$x + 2y + 3z = 11$$
$$2x - 2y - z = 2$$

fh!; ePf;fy; Kiwapy; jPh;f;f/

$$3x - y + 2z = 12$$
$$x + 2y + 3z = 11$$
$$2x - 2y - z = 2$$

(or)

(b) Using Gauss – Jordan method, solve.

$$2x - 3y + z = -1$$
$$x + 4y + 5z = 25$$
$$3x - 4y + z = 2$$

fh!;?$hhld; Kiwapid gad;gLj;jp jPh;f;f/

$$2x - 3y + z = -1$$
$$x + 4y + 5z = 25$$
$$3x - 4y + z = 2$$

(13) (a) Show that $y_3 = y_2 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0$

$y_3 = y_2 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0$ vdf; fhl;Lf/

(or)

(b) Obtain the function whose first difference is $9x^2 + 11x + 5$

Kjy; tpj;jpahrk; $9x^2 + 11x + 5$ vdf; bfhz;Ls;s rhh;igf; fhz;f/

(14) (a) using the following table, apply Gauss's forward formula to get f (3.75)

x	2.5	3.0	3.5	4.0	4.5	5.0
f(x)	24.145	22.043	20.225	18.644	17.262	16.047

gpd;tUk; ml;ltizf;F fh!pd; Kd;ndhf;F Nj;jpuj;ij gad;gLj;jp
(3/75)d; kjpg;g[fhz;f/

x	2.5	3.0	3.5	4.0	4.5	5.0
f(x)	24.145	22.043	20.225	18.644	17.262	16.047

(b) If $\sqrt{12500} = 111.803399, \sqrt{12510} = 111.848111, \sqrt{12520} = 111.892805,$ $\sqrt{12530} = 111.937483$ find $\sqrt{12516}$ by Gauss's backward formula.

$\sqrt{12500} = 111.803399, \sqrt{12510} = 111.848111, \sqrt{12520} = 111.892805,$ $\sqrt{12530} = 111.937483$ vdpy; d; kjpg;ig fh!;!pd; gpd;ndhf;F Nj;jpuj;ij gad;gLj;jpf; fhz;f/

(15) (a) From the following table find f(x) and here f(6) using Newton's interpeter formula.

x :	1	2	7	8
f(x):	1	5	5	4

gpd;tUk; ml;ltiza[ld; epa{l;ldpd; ,il brUfiyg; gad;gLj;jp f(x) kw;Wk; f(6) fhz;f/

x :	1	2	7	8
f(x):	1	5	5	4

(or)

(b) Using Lagrange's formula of interpetation find y (9.5) given

x :	7	8	9	10
y :	3	1	1	9

x :	7	8	9	10
y :	3	1	1	9

vDk; ml;ltizapypUe;J byf;uh";rpapd; ,ilr;brUfiy gad;gLj;jp y (9.5) d; kjpg;g[fhz;f/

Section – C (5 x 12 = 60 Marks)

(16) (a) Find the positive roof of $x_e^{\,x} = 2$ by the method of false position.

jtwhd epiy Kiwapd;go $x_e^{\,x} = 2$ d; kpif jPh;t[fhz;f/

(or)

(b) Find the real root of the equation $x^3 - 6x + 4 = 0$ between 0 and 1 using Newton – Raphson method.

$x^3 - 6x + 4 = 0$ vd;w rkd;ghl;od; 0 kw;Wk; 1 ,ilapy; mike;Js;s bka; K:yj;jpid epa{l;ld; uhg;rd; Kiwia gad;gLj;jp fhz;f/

(17) (a) Solve by Gauss – Seidal method.

$$28x + 4y - z = 32$$
$$2x + 17y + 4z = 35$$

$$x + 3y + 10z = 24$$

fh!; rPly; Kiwapy; jPh;f;f/

$$28x + 4y - z = 32$$
$$2x + 17y + 4z = 35$$
$$x + 3y + 10z = 24$$

(or)

(b) Using Gaues-Jacobe method solve.

$$x + 17y - 2z = 48$$
$$30x - 2y + 3z = 75$$
$$2x + 2y + 18z = 30$$

fh!;?n$fgp Kiwiag; gad;gLj;jp jPh;f;f/

$$x + 17y - 2z = 48$$
$$30x - 2y + 3z = 75$$
$$2x + 2y + 18z = 30$$

(18) (a) Express any value f Y in terms of Y_n and the backward differences of Y_n.
Y? d; ve;j kjpg;iga[k; Y_n kw;Wk; Y_n d; gpd;ndhf;F tpj;jpahr';fspy; tpthpf;ft[k;/

(or)

(b) Find the second difference of □□ with h = 2
h = 2 vdf; bfhz;L □ EMBED Equation.3 □□□ d; ,uz;lhtJ tpj;jpahrj;ijf; fhz;f/

(19) (a) Find the value of cos 510 421 by using Gauss's backward interpolation formula from the table given below.

X	500	510	520	530	540
Y= cos x	.6428	.6293	.6157	.6018	.5878

gpd;tUk; ml;ltizapy; cos 510 421 kjpg;ig fh!;!pd; gpd;ndhf;F ,ilr; brUfiy gad;gLj;jp fhz;f/

X	500	510	520	530	540
Y= cos x	.6428	.6293	.6157	.6018	.5878

(or)

(b) From the following table using Stirling's formula estimate the value of Tan 16

X	00	50	100	150	200	250	300
Y= tan x	0.0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

X	00	50	100	150	200	250	30^0
Y= tan x	0.0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

gpd;tUk; ml;ltizapy Tan 16;d; kjpg;ig !;l;hpy;yp!; Nj;jpuj;ij gad;gLj;jp fhz;f/

(20) (a) Using Netwon's divided difference formula, find the values of f(2), f(8) and f(15) given the following table.

X	4	5	7	10	11
F(x)	4.8	100	294	900	2028

(b) find the value of θ given f(θ) =.3887 where $f(\theta) = \int_0^{\theta} \frac{d\theta}{\sqrt{1-\frac{1}{2}\sin^2\theta}}$ using the table

θ	21^0	23^0	25^0
f(θ)	.3706	.4068	.4433

(or)

gpd;tUk; ml;ltizapypUe;J θ tpd; kjpg;igf; fhz;f/

θ	21^0	23^0	25^0
f(θ)	.3706	.4068	.4433

,';F f(θ)=.3887 nkYk; $f(\theta) = \int_0^{\theta} \frac{d\theta}{\sqrt{1-\frac{1}{2}\sin^2\theta}}$

DISCRETE MATHEMATICS

Time : 3 Hours Maximum : 100 Marks

SECTION – A **(10 X 1 = 10)**

1. A _____ is an expression which is a string consisting of variables, parentheses and connective symbols.
2. The dual of (P $\wedge$ Q) $\vee$ T is _____
3. P $\rightarrow$ Q $\Leftrightarrow$ _____
4. If f(x) = x + 2 and g(x) = x^2 – 1 then find (g o f) (x)
5. If s $\rightarrow \alpha$ s and s $\rightarrow \alpha$ be the productions in a grammar G, then the grammar is called _____.
6. _____ is one in which rows are represented by states and columns are represented by input symbols.
7. (α , *, $\oplus$) be a lattice and a, b $\in$ L , then a * (a $\oplus$ b) = a is called _____.

8. If a and b be any two elements of a Boolean algebra then a * (a' $\oplus$ b) = _____
9. A graph that has neither self loops nor parallel edges is called a _____
10. If the degree of the vertex are equal then it is called _____

SECTION – B **(5 X 6 = 30)**

11. (a) Prove that $P \rightarrow (Q \rightarrow R) \Leftrightarrow (P \wedge Q) \rightarrow R$.

(OR)

(b) Obtain the principle conjunctive normal form of

$P \vee (7P \rightarrow (Q \vee (7Q \rightarrow R)))$

12. (a) Show that $(7P \wedge (7Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$

(OR)

(b) Define Composite function. Also let $f : R \rightarrow R$ and $g : R \rightarrow R$ defined by $f(x) = 4x - 1$, $g(x) = \cos x$ then find fog and gof.

13. (a) Define

(i) Deterministic Finite Automaton.

(ii) Non Deterministic Finite Automaton.

(OR)

(b) Explain the procedure for converting the given non-deterministic finite automata and finite automata.

14 (a) State and Prove the distributive in equality of a lattice.

(OR)

(b) In any Boolean Algebra, Prove that $(a \wedge b)' = a' \vee b'$ and $(a \vee b)' = a' \wedge b'$

15 (a) Define the following terms with example.

(i) Connected Graph

(ii) Hamiltonian Cycle

(OR)

(b) "Every tree can be uniquely represented by a binary tree" discuss with example.

SECTION – C **(5 X 12 = 60)**

16 (a) Show that

(i) $7(P \wedge Q) \rightarrow (7P \vee (7P \vee Q)) \Leftrightarrow (7P \vee Q)$

(ii) $(P \vee Q) \wedge (7P \wedge (7P \vee Q)) \Leftrightarrow (7P \wedge Q)$

(OR)

(b) Show that the following are equivalent formulae

(i) $P \vee (P \wedge Q) \Leftrightarrow P$

(ii) $P \vee (7P \wedge Q) \Leftrightarrow P \vee Q$

17 (a) Show that

$(x)\ (P(x) \vee Q(x)) \Rightarrow (x)\ P(x) \vee (\exists x)\ Q(x)$

(OR)

(b) (i) What is equivalence relation? Give an example.

(ii) Let R be a binary relation on the set of all positive integers such that $R = \{ (a,b) \mid a = b^2 \}$. Is R Reflexive? Symmetric? Anti Symmetric?.

18 (a) Define the following grammar.
(i) Context Sensitive Grammar
(ii) Context Free Grammar
(iii) Regular Grammar

(OR)

(b) Explain deterministic finite automaton. Also give a DFA accepting the set of all strings over {0,1} with three consecutive 0's.

19 (a) Let $(<, \leq)$ be a lattice. For any a, b, c $\in$ L. Prove that the following distributive inequations hold

$$a \oplus (b * c) \leq (a \oplus b) * (a \oplus c)$$
$$a * (b \oplus c) \geq (a * b) \oplus (a * c)$$

(OR)

(b) Find the canonical form of a Boolean function.

$F = [\ x + (x' + y)'\ ] * [\ x + (y' * z')'\ ]$

20 (a) Define the following with an example.
(i) Multi Graph
(ii) Euler Graph
(iii) Isomorphic Graph

(OR)

(b) Explain the matrix representation of graphs with example.

Time: 3 Hrs **GRAPH THEORY** **Maximum : 100 Marks**

Section – A (10 X 1 = 10)

1. An end vertex in a graph is a vertex of degree ____
2. The length of a Hamilton path in a connected graph on n vertex is _____.
3. If n is a odd number such that n ≥ 3 Then find the number of edge disjoint Hamiltan circuits of a complete graph K_n is___
4. A vertex with minimum eccentricity in a graph G is called ____ of G.
5. Find the rank of the incidence matrix of a graph on n vertices.
6. Every edge of a tree is a _____.
7. A connected graph on n vertices with (n-1) edges is a _____.
8. Every Bipartite graph with atleast one edge has chromatic number _____ .
9. Every circuit has _____ of edges in common way with any cut - set.
10. The reduced incidence matrix of a tree is _____.

Section - B (5x6=30)

11 a. Prove that the number of vertices of odd degree in a graph is even

(OR)

b. If G is a connected graph with exactly 2k odd vertices, prove that there exist k edge-disjoint subgraphs such that they together contain all edges of G and that each is a univursal graph.

12. a. Prove that a tree with a n vertices has (n-1) edges.

(OR)

b. Prove that a graph with n vertices (n-1) edges and no circuits is connected.

13. a. Define the vertex connectivity and edge connectivity of a graph. Prove that the vertex connectivity of a graph can never exceed its edge connectivity.

(OR)

b. Prove that the complete graph on five vertices is non planar.

14 a. If B is a circuit matrix of a connected graph G with e edges and n vertices, prove that rank of B = e-n+1

(OR)

b. Define path matrix and illustrate with an example

15. a. Prove that every tree with two or more vertices is 2 – chromatic

(OR)

b. Prove that a graph on a vertices is complete if and only if its chromatic polynomial is $pn(\lambda)=\lambda(\lambda-1)(\lambda-2)\ldots(\lambda-n+1)$

Section - C (5x12=60)

16. a. Prove that a simple graph on n vertices and k components can have almost (n-k) (n- k+1)/2 edges.

(OR)

b. Prove that a connected graph is an Euler graph if and only if all vertices are of even degree.

17. a. Define the center of a graph. Prove that every tree has either one vertex or two adjacent vertices as its center.

(OR)

b. Prove that a spinning tree T of a given weighted connected graph is a shortest spanning tree of G if and only if there exists no other spinning tree of G if and only if there exists no other spanning tree of G at a distance of one from T whose weight is smaller than that of T.

18. a. Prove that the maximum vertex connectivity that can achieve with a graph on n vertices and e edges ($e \geq n-1$) is (2e/n)

(OR)

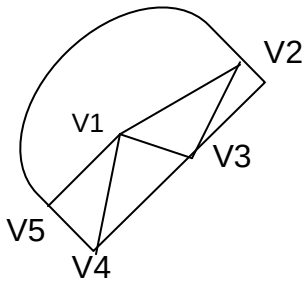
b. State and prove the Euler's Formula for a connected planar graph.

19. a. Prove that the rank of A(G) is n-1 Where A(G) is the incidence matrix of a connected graph G.

(OR)

b. If A and B are respectively, the circuit matrix and the incidence matrix whose columns are arranged using the same order of edges, prove that $A.B^T=B.A^T=0$ (mod 2)

20 a. Explain what is a chromatic number and chromatic polynomial of a graph. Find the chromatic polynomial for the graph G given below.



(OR)

b. Prove that the vertices of every planar graph can be properly colored with five colors.

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AOS – Numerical Methods II

Time : 3 Hours Maximum : 100 Marks

Section – A (10 x 1 = 10 Marks)

Answer all Questions

1. The relation between E and Δ is ……
   E kw;Wk; Δd; bjhlh;g[//////////////////////

2. $y_p = y_0 + p\Delta y_0$ of Gregory Newton formula corresponds to ….....

3. State Simpson's 1/3 Rule.
   Rpk;rdpd; 1-3 Nj;jpuj;ij vGJf/

4. State Trapezoidal Rule.
   Oug;rha;ly; Nj;jpuj;ij vGJf/

5. Newton's divided difference formula for equal intervals is called _____

6. δ is given in terms of E as ……..
   δ vd;gJ E-ia bghWj;J ////////////////
δ
7. Write down the Milne's predictor and Corrector algorithm.

8. Write decon Reange – Kutta algorithm (4th order)
   u';nf ? Fl;lh Kiwia vGJf/

9. Euler's method is a Taylor's series method of …….. order.
   Ma;yh; Kiw vd;gJ ila;yh; bjhlhpd; //////////////// thpir MFk;/

10. State the Adams – Bashforth Predictor corrected formula.

Section – B (5 x 6 = 30 Marks)

(11) (a) Find the first derivative of the function tabulated below at x = 0.6

x	0.4	0.5	0.6	0.7	0.8
Y	1.5836	1.7974	2.0442	2.3275	2.6511

gpd;tUk; ml;ltizapy; ,Ue;J x = 0/6 vd;w g[s;spapy; Kjy; tiff; bfG fhz;f/

x	0.4	0.5	0.6	0.7	0.8
y	1.5836	1.7974	2.0442	2.3275	2.6511

(OR)

(b) Given the following data, find the maximum value of y

x	0	1	2	3	4	5
y	0	.25	0	2.25	16.00	56.25

gpd;tUk; tpgu';fspypUe;J y kPg;bgU kjpg;ig fhz;f/

x	0	1	2	3	4	5
y	0	.25	0	2.25	16.00	56.25

(12) a) Using the following data, find $f'(5)$.

x	0	2	3	4	7	9
y	4	26	58	112	466	922

gpd;tUk; tpgu';fspypUe;J $f'(5)$ I fhz;f/

x	0	2	3	4	7	9
y	4	26	58	112	466	922

(OR)

(12) (b) Evaluate $\int_0^1 \frac{1}{1+x^2}dx$ using Trapezoidal rule with h = 0.25;

h = 0.25 vdf; bfhz;L rhptf tpjpia gad;gLj;jp $\int_0^1 \frac{1}{1+x^2}dx$ d; kjpg;ig fzf;fpLf/

(13) (a) Find the difference equation from $y_x = a.2^x + b.3^x$

$y_x = a.2^x + b.3^x$ ypUe;J tpj;jpahr rkd;ghl;ilf; fhz;f/

(OR)

(b) Find the difference equation from $y_x = a.2^x + b(-2)^x$

$y_x = a.2^x + b(-2)^x$ ypUe;J tpj;jpahr rkd;ghl;ilf; fhz;f/

(14) (a) Using Taylor's series method find y(0.1) given $\frac{dy}{dx} = x + y, y(0) = 1$.

$\frac{dy}{dx} = x + y, y(0) = 1$vdpy; bla;yhpd; bjhliu cgnahfg;gLj;jpd; kjg;igf; y(0.1) fhz;f/

(OR)

(b)Given y'= -y and y(0) = 1 determine the values of y at x= .01, .02 by Euler method.

y'= -y , y(0) = 1 vdpy; yd; kjpg;ig x= .01, kw;Wk; x= .02 vd;gjpy; Ma;yhpd; Kiwia gad;gLj;jpf; fhz;f/

(15) (a) Using mile's method find y(4.4) given $5xy' + y^2 - 2 = 0$ given y(4) = 1, y(4.1)=1.0049 y(4.2) = 1.0097 and y(4.3) = 1.0143.

, y(4.1)=1.0049 y(4.2) = 1.0097 and y(4.3) = 1.0143 vdpy; kpy;dP!; Kiwiag; gad;gLj;jp y(4.4)d; kjpg;igf; fhz;f/

(OR)

(b) Solve and get y(2) given $\frac{dy}{dx} = \frac{1}{2}(x+y)$, y(0) = 2 y(0.3) = 2.636 y(1) = 3.595 y(1.5) = 4.968 by Adam's method.

$\frac{dy}{dx} = \frac{1}{2}(x+y)$, y(0) = 2 y(0.3) = 2.636 y(1) = 3.595 y(1.5) = 4.968vdpy; Mlk;!; Kiwiag; gad;gLj;jp y(2) d; kjpg;igf; fhz;f/

Section – C (5 x 12 = 60 Marks)

(16) (a) Use Newton-Gregory forward formula find the value of Y when x=142^0

x	140^0	150^0	160^0	170^0	180^0
y	3.685	4.854	6.302	8.076	10.225

epa{l;ld;?fphpfhp Kd;Kf Nj;jpuj;ij gad;gLj;jp x=142^0 y; y aif; fhz;f/

x	140^0	150^0	160^0	170^0	180^0
y	3.685	4.854	6.302	8.076	10.225

(OR)

(b) Derive Newton-Gregory backward difference formula for interpolation.
,ilbrUfYf;fhd epa{l;ld; fphpfhp gpd;Kf tpj;jpahr Nj;jpuj;jpid jUtp/

(17) (a) Evaluate $\int_0^1 e^x dx$ by simpson's me third rule correct to five decimal places, by proper choice of h.

rpk;rdpd; 1-3 Nj;jpuj;ij cgnahfg;gLjjp $\int_0^1 e^x dx$ d; kjpg;g[fhz;f/

(OR)

(b) Evaluate $\int_{-3}^{x} x^4 dx$ by using (1) Trapezoidal rule (2) Simpson's rule verify your results by actual integration.

$\int_{-3}^{x} x^4 dx$ vd;gij oug;rhaply; Nj;jpuj;jpYk; rpk;rdpd; Nj;jpuj;jpYk; kjpg;g[fhz;f/ nkYk; ,e;j ,U Kot[fisa[k; bjhif fhQqk; Kiwapy; fpilg;gJld; xg;gplt[k;/

(18) (a) solve $y_{x+2} - y_{x+1} + y_x = 0$ given $y_0 = 1, y_1 = \frac{\sqrt{3}+1}{2}$

$y_0 = 1, y_1 = \frac{\sqrt{3}+1}{2}$ vdpy; $y_{x+2} - y_{x+1} + y_x = 0$ jPh;f;f/

(b) Solve $\Delta ux + \Delta^2 ux = \cos x$

$\Delta ux + \Delta^2 ux = \cos x$ jPh;f;f/

(19) (a) Compute y at x= 0.25 by modified Euler method given y'=2xy, y(0) = 1
Ma;yhpd; g[JKiwia gad;gLj;jp yd; kjpg;ig x= 0.25 vDk; ,lj;jpy; y'=2xy, y(0) = 1vd;gij itj;J fhz;f/

(OR)

(b)Apply the fourth order Range kutta method to fixed y(0.2) given that y'=x + y, y(0) = 1

y'=x + y, y(0) = 1 vdpy; y(0.2) d; kjpg;ig u';nf?Fl;lh Kiwapd; 4k;go Nj;jpuj;ij gad;gLj;jp fhz;f/

(20) (a) Determine the value of y(0.4) using Mline's method given y'=xy+y^2, y(0) =1 use Taylor series to get the vales of y(0.1), y(0.2) and y(0.3)

y'=xy+y^2, y(0) =1 vdpy; y(0.1), y(0.2) kw;Wk; y(0.3)d; kjpg;g[fis bla;yhpd; Nj;jpuj;ij gad;gLj;jp bgw;W y(0.4) d; kjpg;ig Kiwia gad;gLj;jp fhz;f/

(OR)

(b) Find y(0.1), y(0.2) ,y(0.3) from $\frac{dy}{dx} = xy + y^2$, y(0) = 1 by using Runge-kutta method and hence obtain y(0.4) using Adam's method.

$\frac{dy}{dx} = xy + y^2$, y(0) = 1vdpy; y(0.1), y(0.2) kw;Wk; y(0.3) d; kjpg;g[fis u';nf Fl;lh Kiwia gad;gLj;jp fhz;f/ nkYk; y(0.4) d; kjpg;ig Adam?d; Kiwia gad;gLj;jp fhz;f/

OPERATIONS RESEARCH - I

Time : 3 Hours Maximum : 100 Marks

SECTION – A **(10 X 1 = 10)**

1. Give any two definitions or OR.
   OR - ý þÃñÎ Å¨ÃÂ¨È¸¨Ç ±ØÐ¸.
2. Write down the phases of OR.
   OR ý À¢Ã¢×¸¨Ç Å¢ÅÃ¢
3. Define Feasible solution.
   ¬¾¡Ã ²÷Ò¨¼Â ¾£÷× - Å¨ÃÂÚ.
4. Define Slash Variable.
   ¯ ÀÃ¢ Á¡È¢¨Â Å¨ÃÂÚ
5. What is meant by dual problem?
   þÕ¨Á ¸½ì Ì ±ýÈ¡ø ±ýÉ?
6. The dual of dual is _____.
   þÕ¨ÁÂ¢Öõ þÕ¨Á ±ýÀÐ____.
7. Define : Non – degenerate basic feasible solution in transportation model.
   §À¡ÌÅÃòÐ Å¨¸Â¢ø º¢¨¾×üÈ «ÊôÀ¨¼ ²üÒ¨¼Â ¾£÷¨Å Å¨ÃÂÚ.
8. What is optimum utilization of the transportation model?
   §À¡ÌÅÃòÐ Å¨¸Â¢ø ¯ ò¾Á ¦ºÂø ¾¢ð¼ò¾¢ý ÀÂýÀ¡Î ±ýÉ?
9. Compare Transportation and Assignment models.
   §À¡ÌÅÃòÐ À¢ÃîºÉ ÁüÚõ ´Ðì¸£ðÎ ¸½ì¸¨Ç ´ôÀ¢Î.
10. Write down the mathematical representation of assignment models.
    ´Ðì¸£ðÎ ¸½ì¸¢ø ¸½¢¾ ÅÊÅò¨¾ò ¾Õ¸.

SECTION – B **(5 X 6 = 30)**

11 (a) Briefly explain scientific methods in operations research.
OR - ý «È¢Å¢Âø Ó¨È¸¨Ç Å¢ÇÌì¸.

(OR)

(b) Discuss the significance and scope of OR in modern management.

¿Å£É §ÁÄ¡ñ¨ÁÂ¢ø OR - ý Óì¸¢ÂòÐÅõ ÁüÚõ º¢ÈôÀõºí¸¨Ç Å¢ÅÃ¢.

12 (a) Show that these is an unbounded solution to the following L.P.P.

Maximize $Z = 4x_1+x_2+3x_3+5x_4$

Subject to

$$4x_1-6x_2-5x_3-4x_4 \geq -20$$
$$-3x_1-2x_2+4x_3+x_4 \leq 10$$
$$-8x_1-3x_2+3x_3+2x_4 \leq 20 \qquad x_1,x_2,x_3,x_4 \geq 0$$

À¢ýÅÕõ L.P.P -ý ¾£÷×¸¨Çì ¸¡ñ¸.

Á£ô¦ÀÃ¢Â¾¡ì̀ $Z = 4x_1+x_2+3x_3+5x_4$

¸ðÎôÀ¡Î¸û

$$4x_1-6x_2-5x_3-4x_4 \geq -20$$
$$-3x_1-2x_2+4x_3+x_4 \leq 10$$
$$-8x_1-3x_2+3x_3+2x_4 \leq 20 \qquad x_1,x_2,x_3,x_4 \geq 0$$

(OR)

(b) What are the steps involved in charnes penalty method?

º¡÷ýŠ ¾ñ¼¨É Ó¨ÈÂ¢ø §¿÷§¸¡ðÎ ¾¢ð¼Á¢¼ø ¸½ì̀¸¨Ç ¾£÷ì̀õ ÀÊ¸¨Ç Å¢ÅÃ¢.

13 (a) Write the dual of the following L.P.P.

(i) Maximize $Z = 5x_1+8x_2$

Subject to

$$3x_1+5x_2 = 18$$
$$5x_1+3x_2 = 14 \qquad x_1,x_2 \geq 0$$

(ii) Maximize $Z = 5x_1+8x_2$

Subject to

$$x_1-2x_2 \leq 1$$
$$x_1+2x_2 \geq 3 \qquad x_1,x_2 \geq 0$$

À¢ýÅÕõ L.P.P -ý þÕ¨Á¨Âì ¸¡ñ¸.

(i) Á£ô¦ÀÃ¢Â¾¡ì̀ $Z = 5x_1+8x_2$

¸ðÎôÀ¡Î¸û

$$3x_1+5x_2 = 18$$
$$5x_1+3x_2 = 14 \qquad x_1,x_2 \geq 0$$

(ii) Á£ô¦ÀÃ¢Â¾¡ì̀ $Z = 5x_1+8x_2$

¸ðÎôÀ¡Î¸û

$$x_1-2x_2 \leq 1$$
$$x_1+2x_2 \geq 3 \qquad x_1,x_2 \geq 0$$

(OR)

(b) Write the dual of the following L.P.P.

(i) Minimize $Z = x_1+2x_2+x_3$

Subject to

$$x_1+\frac{1}{2}x_2+\frac{1}{2}x_3 \leq 1$$
$$\frac{3}{2}x_1+2x_2+x_3 \geq 8 \qquad x_1,x_2,x_3 \geq 0$$

(ii) Minimize $Z = 2x_1+3x_2$

Subject to

$$x_1-2x_2 \leq 0$$

$-2x_1+3x_2 \geq -6$ x_1,x_2 Unrestricted

À¢ýÅÕõ L.P.P -ý þÕ¨Á¨Âì ¸¡ñ¸.

(i) Á£îº¢È¢Â¾¡ì Z = $x_1+2x_2+x_3$

¸ðÎôÀ¡Î¸û

$$x_1+\frac{1}{2}x_2+\frac{1}{2}x_3 \leq 1$$

$$\frac{3}{2}x_1+2x_2+x_3 \geq 8 \quad x_1,x_2,x_3 \geq 0$$

(ii) Á£îº¢È¢Â¾¡ì Z = $2x_1+3x_2$

¸ðÎôÀ¡Î¸û

$$x_1-2x_2 \leq 0$$

$$-2x_1+3x_2 \geq -6 \qquad x_1,x_2 \text{ Unrestricted}$$

14 (a) Explain the Voge's Approximation method.

§Å¡ì¸¢ý §¾¡Ã¡Â Ó¨È¨Â Å¢ÅÃ¢.

(OR)

(b) What are the steps involved in formulation of transportation?

§À¡ìÌÅÃòÐ À¢Ãîº¨É ¸½ì¸¨Ç «¨ÁìÌõ Ó¨È¨Â Å¢ÅÃ¢?.

15 (a) A company has a team of four salesman and these are four districts where the company wants to starts its business. After talking into account the capabilities of salesmen and the nature of districtly the company estimates that the profit per day in rupees for each salesman in each district is as below.

		District 1	2	3	4
Salesman	A	16	10	14	11
	B	14	11	15	15
	C	15	15	13	12
	D	13	1 2	14	15

´Õ ¿¢ÚÅÉõ 4 Å¢üÀ¨ÉÂ¡Ç÷¸¨Ç ¿¡ýÌ Á¡Åð¼ò¾¢üÌ Å¢üÀ¨É¡¸¡¸ «ÛôÀôÀð¼Ð. ¸£úÅÕõ «ð¼Å¨½Â¢ø ´ù¦Å¡Õ Å¢üÀ¨ÉÂ¡ÇÕõ ´ù¦Å¡Õ Á¡Åð¼ò¾¢üÌ ´Õ ¿¡Ç¢ø ¦ºøÅ¾ü¸¡É Á£ô¦ÅÕõ ¸¡Ä «Ç¨Å ¸½ì¸£ðÎ ¸¡ñ¸.

Å¢üÀ¨ÉÂ¡Ç÷

	Á¡Åð¼õ 1	2	3	4
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	1 2	14	15

(OR)

(b) Solve the following Assignment Problem.

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	15

À¢ýÅÕõ ´Ðì¸£ðÎ ¸½ì¨¸ò ¾£÷ì¸.

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	15

SECTION – C **(5 X 12 = 60)**

16 (a) Discuss the role of OR models in decision making.

¾£÷× ¸¡Ïõ Ó¨ÈÂ¢ø OR ý ÓÌ¸¢Â Àí¸¢¨É Å¢ÅÃ¢.

(OR)

(b) Find the maximum as well as minimum value of the objective function Z = 4x+5y

Subject to $2x+y \leq 6$

$x+2y \leq 5$

$x-2y \leq 2$

$-x+y \leq 2$

$x+y \geq 1$ $x,y \geq 0$ by using graphical method.

Å¨ÃÀ¼ Ó¨È¨Â ÀÂýÀÎò¾¢ ¸£úì¸¡Ïõ §¿÷§¸¡ðÎ ¾¢ð¼Á¢¼ø ¸½ì ¸¢ý Á£ô¦ÀÕ Á¾¢ôÒ ÁüÚõ Á£î º¢Ú Á¾¢ôÀ¢¨É Å¢ÅÃ¢. Z = 4x+5y

¸ðÎôÀ¡Î¸û

$2x+y \leq 6$

$x+2y \leq 5$

$x-2y \leq 2$

$-x+y \leq 2$

$x+y \geq 1$ $x,y \geq 0$

17 (a) Use M-technique to solve the following L.P.P.

Minimize $Z = 4x_1+x_2$

Subject to

$3x_1+x_2 = 3$

$4x_1+3x_2 \geq 6$

$x_1+2x_2 \leq 3$ $x_1,x_2 \geq 0$

À¢ýÅÕõ §¿÷§¸¡ðÎ ¾¢ð¼Á¢¼ø ¸½ì¨¸ ¦ÀÃ¢Â M-Ó¨È¨Â Å¢ÅÃ¢.

Á£î º¢È¢Â¾¡ìÌ $Z = 4x_1+x_2$

¸ðÎôÀ¡Î¸û

$3x_1+x_2 = 3$

$4x_1+3x_2 \geq 6$

$x_1+2x_2 \leq 3$ $x_1,x_2 \geq 0$

(OR)

(b) Use two phase method to solve

Maximize $Z = 5x - 2y + 3z$

Subject to

$2x + 2y - z \geq 2$
$3x - 4y \leq 3$
$y + 3z \leq 5$ $\quad x,y,z \geq 0$

À¢ýÅÕõ L.P.P. -¨Â þÕ ¸ð¼ Ó¨È¨Â ÀÂýÀÎò¾¢ ¾£÷ì¸.
Á£ô¡ÀÃ¢Â¾¡ì Z = 5x – 2y + 3z
¸ðÎôÀ¡Î¸û

$2x + 2y - z \geq 2$
$3x - 4y \leq 3$
$y + 3z \leq 5$ $\quad x,y,z \geq 0$

18 (a) Use duality to solve the following L.P.P.
Maximize $Z = 3x_1+2x_2$
Subject to

$x_1+x_2 \geq 1$
$x_1+x_2 \leq 7$
$x_1+2x_2 \leq 10$
$x_2 \leq 3$ $\quad x_1,x_2 \geq 0$

þÕ¨Á Ó¨È¨Âô ÀÂýÀÎò¾¢ À¢ýÅÕõ L.P.P-¨Â ¾£÷ì¸
Á£ô¡ÀÃ¢Â¾¡ì $Z = 3x_1+2x_2$

¸ðÎôÀ¡Î¸û

$x_1+x_2 \geq 1$
$x_1+x_2 \leq 7$
$x_1+2x_2 \leq 10$
$x_2 \leq 3$ $\quad x_1,x_2 \geq 0$

(OR)

(b) Use Duality to solve the following L.P.P.
Minimize $Z = 3x_1+2x_2+5x_3$
Subject to

$x_1+ x_2+x_3 \leq 9$
$2x_1+3x_2+5x_3 \leq 30$
$2x_1-x_2-x_3 \leq 8$ $\quad x_1,x_2,x_3 \geq 0$

þÕ¨Á Ó¨È¨Âô ÀÂýÀÎò¾¢ À¢ýÅÕõ L.P.P-¨Â ¾£÷ì¸.
Á£îº¢È¢Â¾¡ì $Z = 3x_1+2x_2+5x_3$

¸ðÎôÀ¡Î¸û

$$x_1 + x_2 + x_3 \le 9$$
$$2x_1 + 3x_2 + 5x_3 \le 30$$
$$2x_1 - x_2 - x_3 \le 8 \qquad x_1, x_2, x_3 \ge 0$$

19 (a) Give a mathematical formulation of the transportation and simplex methods. What are the difference in the nature of problems that can be solved by these methods.

§À¡ìÌÅÃòÐ À¢Ãîº¨É ¸½ìÌ ÁüÚõ º¢õôÄìŠ Ó¨ÈÂ¢ý ¸½¢¾ «¨ÁôÒ¸¨Ç ±ØÐ¸. §ÁÖõ þùÅ¢Õ ¸½ìÌ¸¨Ç ¾£÷ÌÌõ §À¡Ð ¯ûÇ §ÅÚÀ¡Î¸¨Ç ±ØÐ¸.

(OR)

(b) Solve the following transportation problem.

		Stores (Destination)						Surplus
War chows	1	9	12	9	6	9	10	5
	2	7	3	7	7	5	5	6
	3	6	5	9	11	3	11	2
	4	6	8	11	2	2	10	9
Requirement		4	4	6	2	4	2	

À¢ýÅÕõ §À¡ìÌÅÃòÐ À¢Ãîº¨É ¸½ì¨¸ ¾£÷.

		Stores (Destination)						Surplus
War chows	1	9	12	9	6	9	10	5
	2	7	3	7	7	5	5	6
	3	6	5	9	11	3	11	2
	4	6	8	11	2	2	10	9
Requirement		4	4	6	2	4	2	

20 (a) Explain the Hungarian Assignment Algorithm.

†í§¸Ã¢Âý ´Ðì¸£ðÊý ÀÊ¸¨Ç Å¢ÅÃ¢.

(OR)

(b) Solve the following Assignment Problem.

A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

À¢ýÅÕõ ´Ðì¸£ðÎ ¸½ì¨¸ò ¾£÷

A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

OPERATIONS RESEARCH - II

Time : 3 Hours Maximum : 100 Marks

SECTION – A **(10 X 1 = 10)**

1. What are the rules for graph theory?.
   Å¢¨ÇÂ¡ðÎò ¾¢ð¼ ¸½ì¸¢ý Å¢¾¢¸¨Ç ¾Õ¸.
2. Define : optimal strategies.
   Å¨ÃÂÚ : ¯ò¾Á ÌÈ¢Â£Î .
3. Define : Traffic Intensity.
4. Define : Service rate.
5. Define : Demand.
   Å¨ÃÂÚ : §¾¨Å
6. Define : Stock.
   ¿¢Ö¨Å Å¨ÃÂÚ («) §º¸Ã¢ôÒ Å¨ÃÂÚ
7. What is simulation?.
8. What is monte – carlo method ?.
   Á¡ñ§¼¡-¸¡÷§Ä¡ Ó¨È ±ýÈ¡ø ±ýÉ?
9. Define : Path.
   Å¨ÃÂÚ : À¡¨¾
10. Define : Successor activities.

SECTION – B **(5 X 6 = 30)**

11 (a) Explain Two person zero sum game
þÕÅ÷ â^ƒ¢Â Üð¼ø Å¢¨ÇÂ¡ðÊ¨É Å¢ÅÃ¢.

(OR)

(b) Write down the properties of competitative Games.
§À¡ðÊ Å¢¨ÇÂ¡ðÊý ÀñÒ¸¨Ç ±ØÐ¸.

12 (a) Explain the classification of Queueing system.
ÅÃ¢¨º ¡¾¡ÌôÀ¢ý Å¨¸¸¨Ç Å¢ÅÃ¢.

(OR)

(b) Explain the elements of Queueing system.
ÅÃ¢¨º ¡¾¡ÌôÀ¢ý «í¸í¸¨Ç Å¢ÅÃ¢.

13 (a) Explain the various costs associated with inventory control.
ºÃìÌ ¾¢ð¼ ¸½ì¸¨Ç ´Õí¸¢¨½ó¾ Å¢¨ÄÂ¢ý ¦Åù§ÅÚ Å¨¸¸¨Ç Å ¢ÅÃ¢.

(OR)

(b) Explain the E.O.Q. with price break.
E.O.Q. ¨Å Å¢¨Ä ¿¢Úò¾òÐ¼ý Å¢ÅÃ¢.

14 (a) A tourist cab owner has 25 taxis in operation. He keeps three derives as reserve to attend to calls in case the scheduled driver reports sick the probability distribution of sick driver is as below.

Number sick	Probability
0	0.20
1	0.25
2	0.20
3	0.15
4	0.12
5	0.08

Use Manot carlo method to estimate the utilization of reserve derives and the probability that of least method will be off the road due to non-availability of a driver. Compare with the correct answer.

(OR)

(b) Find the value of Π experimentally by simulation.

15 (a) Write down the rules of Network Construction.
Å¨ÄôÀ¢ýÉ¨Ä «¨ÁìÌõ §À¡Ð À¢ýÀüÈ §ÅñÊÂ Å¢¾¢¸¨Çò ¾Õ¸.

(OR)

(b) Construct the network diagram comprising activities B,C, ….. Q and N such that the following constraints are satisfied.

B < E, F ; C < G,L; E, G < H ; L, H < I ; L < M ; H < N ;
H < J ; I, J < P ; P < Q

The relation X < Y means that the activity X must be finished before Y can begin.
¸£§Æ ¦¸¡ÍÌ¸ôÀðÎûÇ ¸ðÎôÀ¡Î¸ÙìÌ Å¨ÄôÀ¢ýÉø Å¨Ã¸.

B < E, F ; C < G,L; E, G < H ; L, H < I ; L < M ; H < N ;
H < J ; I, J < P ; P < Q

þíÌ X < Y ±ýÀÐ X-ø ÓÊÕõ

SECTION – C **(5 X 12 = 60)**

16 (a) Reduce the following game by dominance and find the game value.

		Player – A			
		I	II	III	IV
Player – B	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

À¢ýÅÕõ Å¢¨ÇÂ¡ðÎ ¸½ì¨¸ ¾£÷

		Player – A			
		I	II	III	IV
Player – B	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

(OR)

(b) Solve the following game by graphic method.

	Player - A				
Player - B	-5	5	0	-1	8
	8	-4	-1	6	-5

À¢ýÅÕõ Å¢¨ÇÂ¡ðÎ ¸½ì¨¸ Å¨ÃÀ¼ Ó¨ÈÂ¢ø ¾£÷

	Player - A				
Player - B	-5	5	0	-1	8
	8	-4	-1	6	-5

17 (a) Explain the characteristics of Queueing Models.
ÅÃ¢¨º Ó¨ÈÂ¢ý Ì½í¸¨Ç Å¢ÅÃ¢.

(OR)

(b) A super market has two girls running up sales at the counters. If the service time for each customer is exponential with mean 6 minutes and if people arrive in a Poisson fashion at the rate of 12 per hour,
(i) What is the probability of having to wait for service?
(ii) What is the expected number of customers in the queue?
´Õ Àø¦À¡Õû «í¸¡ÊÂ¢ø þÃñÎ ¦Àñ¸û §Å¨Ä ¦ºö¸¢È¡÷¸û. ´ù¦Å¡Õ Å¡ÊÌ¨¸Â¡ÇÕÌÌõ §º¨Å §¿Ãõ ÀÊÌÈ¢ ÀÃÅø ÁüÚõ ºÃ¡ºÃ¢ 6 ¿¢Á¢¼õ. 1 Á½¢Ì 12 ÁÉ¢¾÷¸û ±ýÈ Å£¾ò¾¢ø À¡ö…¡ý Ó¨ÈÂ¢ø ÅÕ¸¢ýÈ¡÷¸û ±É¢ø
(i) §º¨Åì¸¡¸¡ò¾¢ÕÌÌõ §¿Ãò¾¢ý ¿¢¸ú¾¸× Â¡Ð?
(ii) ÅÃ¢¨ºÂ¢ø ºÃ¡ºÃ¢Â¡¸ Å¡ÊÌ¨¸Â¡Ç÷¸Ç¢ý ±ñ½¢Ì¨¸
±ýÉ?

18 (a) Derive the EOQ formula for shortage model.
ÀüÈ¡ì Ì¨ÈÔ¼ý ÜÊÂ EOQ Ýò¾¢Ãò¨¾ ¾ÕÅ¢.

(OR)

(b) The annual demand for a product 1,00,000 units. The rate of production is 2,00,000 units per year. The set up cost per production run is Rs.5,000 and the production cost of each item is Rs.10. The annual holding cost per unit is 20% of the value of the unit. Find the optimum production lot-size and the length of the production run.
´Õ ¯üÀò¾¢ô ¦À¡Õû ´Õ ÅÕ¼ò¾¢üÌ 1,00,000 «ÄÌ¸û §¾¨ÅôÀÎ¸¢ýÈÉ. ÅÕ¼ò¾¢üÌ ºÃ¡ºÃ¢Â¡¸ 2,00,000 «ÄÌ¸û ¯üÀò¾¢ ¦ºöÂôÂÀÎ¸¢ýÈÐ. ´ÕÓ¨È ¯üÀò¾¢ ¬ÃõÀ¢ì¸ ¾Â¡÷ ¦ºöÂ ¬Ìõ ¦ºÄ× å.5,000 ¬Ìõ. ´Õ «ÄÌ ¯üÀò¾¢î ¦ºÄ× å.10. ´Õ «ÄÌ ¦À¡Õ¨Ç ´Õ ÅÕ¼ò¾¢üÌ ¨Åò¾¢Õì¸ ¬Ìõ ¦ºÄ× ¦À¡ÕÇ¢ý Å¢¨ÄÂ¢ø 20% ¬Ìõ. ¦Á¡ò¾ º¢ì¸É ÀíÌ «Ç¨ÅÔõ, «¾ü¸¡Ìõ ¯üÀò¾¢ì ¸¡Äò¨¾Ôõ ¸¡ñ¸.

19 (a) Three points are chosen at random on the circumference of a circle. Find by Monto – carlo methods the probability that they lie on the same semi-cirle.

(OR)

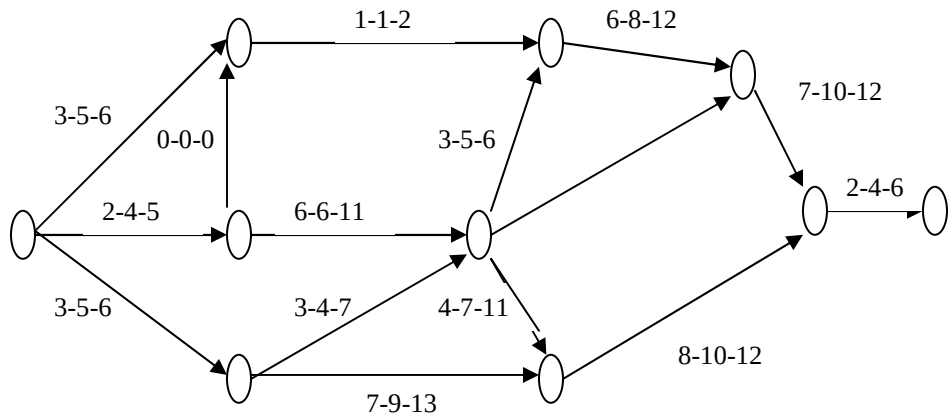
(b) A company has a single service station which has the following characteristics the mean arrival rate of customer and the mean service time 6.2 minutes and 5.5 minutes respectively. The time between and arrival and its service varies from one minute to seven minutes. He arrived service time distribution are given below.

Time (Minutes)	Arrival (Probability)	Service (Probability)
1-2	0.05	0.10
2-3	0.20	0.20
3-4	0.35	0.40
4-5	0.25	0.20
5-6	0.10	0.10
6-7	0.05	-

The queueing process starts at 11 A.M. and closes at 12 P.M. An arrival moves immediately into the service facility if it is empty. On the other hand if the service station is busy, the arrival will wait in the queue. Customers are served on the first come, first served basis.

If the clerk's wages are Rs.6 per hour, would the customer's waiting line costs. Rs.5. per hour, would it be economical for the manager to engage the second clerk? Use Monte – carlo simulation technique.

20 (a) Calculate the variance and expected activity times for the activities of the network shown in the figure below under calculation in the tabular form.
¸£§Æ ¦¸¡Îì¸ôÀðÎûÇ Å¨ÄÀ¢ýÉÖìÌ ±¾¢÷À¡÷ìÌõ §¿Ãõ, ÁüÚõ Å¢Äì¸ Å÷ì¸ ºÃ¡ºÃ¢ ¬¸¢ÂÅü¨È ¸¡ñ¸. §ÁÖõ «Åü¨È ÀðÊÂÄ¢Î¸.



(OR)

(b)

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
to	1	1	2	1	2	2	3
tm	1	4	2	1	5	5	6
tp	7	7	8	1	14	8	15

(i) Draw the project network and identify all the paths throughout
(ii) What is the expected project length?
(iii) Calculate the variance D.S.D. OF project length
(iv) If the project due date is 18 weeks, what is the probability of not meet the due date?

OPERATIONS RESEARCH - III

Time : 3 Hours Maximum : 100 Marks

SECTION – A (10 X 1 = 10)

1. What is L.P.P.?
   ÓØ ±ñ ¾¢ð¼ ¸½ìÌ ±ýÈ¡ø ±ýÉ?
2. What is Gamorian constraints?
   §¸¡ÁÃ¢Â¢ý ¸ðÎôÀ¡Î¸û ±ýÈ¡ø ±ýÉ?
3. Write down a General N.L.P.P.
   §¿÷ ¦¿Ã¢Â¢øÄ¡¾ ¾¢ð¼ ¸½ì¸¢ý ¦À¡Ð ÅÊÅò¨¾ ¾Õ¸.
4. Write down Keetin – Tucter conditions.
   Ìý-¼ì¸÷ ¸ðÎôÀ¡Î¸¨Ç ±ØÐ¸.
5. What is Dynamic Programming Problem?
   þÂø þÂì¸Å¢Âø ¾¢ð¼ ¸½ìÌ ±ýÈ¡ø ±ýÉ?
6. Write down the principle of optimality in Dynamic Programming Problem.
   Å¢¨º þÂì¸ ¦ºÂø ¾¢ð¼õ ¯ò¾Á ¦¸¡û¨¸¨Â «ÊôÀ¨¼ì
   ¦¸¡û¨¸¨Â ±ØÐ.
7. Define Stochastic Process
   Š¦¼¡ì¸¡ŠÊì þÂì¸õ Å¨ÃÂÚ.
8. What is mean by transition probability?.
   Á¡Ú¾ø ¿¢¸ú¾¸× ±ýÈ¡ø ±ýÉ?
9. Write the basic steps involved in the Laplace criterion.
   Ä¡ôÄ¡Š ¾¢ð¼ «Ç¨ÅÂ¢ø þ¼õ ¦ÀÚõ «ÊôÀ¨¼ ÀÊ¸û Â¡¨Å?
10. What is EMV.
    EMV ±ýÈ¡ø ±ýÉ?

SECTION – B (5 X 6 = 30)

11. (a) Explain All Integer Cutting Plane Algorithm.
    ±øÄ¡ ÓØì¸Ç¢ø ¦ÅðÎõ ¾Ç ¦ºÂø ¾¢ð¼ Å¢Çì¸õ
    ¸¡ñ¸.

    (OR)

    (b) Explain Mixed Integer Cutting Plane Algorithm.
    ¸Ä¨Å ÓØì¸Ç¢ø ¦ÅðÎõ ¾Ç ¦ºÂø ¾¢ð¼ Å¢Çì¸õ
    ¸¡ñ¸.

12 (a) Obtain the set of necessary condition for the non-linear programming problem.

Maximize $Z = x_1^2+3x_2^2+5x_3^2$

Subject to

$x_1+ x_2+3x_3 = 2$

$5x_1+2x_2+x_3 = 5$ $x_1,x_2,x_3 \geq 0$

À¢ýÅÕõ §¿÷ ¦¿Ã¢Â¢øÄ¡¾ ¸½ì¨¸ò ¾£÷ì¸. §¾¨ÅÂ¡É ¿¢Àó¾¨É ¸¨Çò ¸¡ñ¸ Á£ô¦ÀÃ¢Â¾¡ì Ì $Z = x_1^2+3x_2^2+5x_3^2$

¸ðÎôÀ¡Î¸û

$x_1+ x_2+3x_3 = 2$

$5x_1+2x_2+x_3 = 5$ $x_1,x_2,x_3 \geq 0$

(OR)

(b) Solve the following L.P.P.

Minimize $Z = 2x_1^2-24x_1+2x_2^2-8x_2+2x_3^2-12x_3+200$

Subject to $x_1+ x_2+x_3 = 11$ $x_1,x_2,x_3 \geq 0$

À¢ýÅÕõ §¿÷ ¦¿Ã¢Â¢øÄ¡¾ ¸½ì¨¸ò ¾£÷ì¸.
Á£îº¢È¢Â¾¡ì Z = $2x_1^2-24x_1+2x_2^2-8x_2+2x_3^2-12x_3+200$
¸ðÎôÀ¡Î¸û
$x_1+x_2+x_3 = 11$ $x_1,x_2,x_3 \geq 0$

13 (a) Briefly explain the characteristic of Dynamic Programming.
þÂì¸ ¾¢ð¼ ¸½ì¸Ç¢ý ÀñÒ¸¨Ç ÍÕì¸Á¡¸ ¬Ã¡ö¸.

(OR)

(b) Use Dynamic Programmed to find the value of
Maximum $Z=y_1 . y_2 . y_3$
Subject to the constraints $y_1+y_2+y_3=5$ $y_1, y_2, y_3 \geq 0$
þÂø þÂì¸ ¾¢ð¼ò¨¾ô ÀÂýÀÎò¾¢
Á£ô¦ÀÃ¢Â¾¡ì $Z=y_1 . y_2 . y_3$
¸ðÎôÀ¡Î¸û $y_1+y_2+y_3=5$ $y_1, y_2, y_3 \geq 0$

14 (a) What are the steps involved in construction of a state-transition matrix.
¿¢¨ÄÁ¡Ú¾ø «½¢Â¢ý «¨ÁôÀ¢ø þ¼õ ¦ÀÚõ ÀÊ¸¨Çì ÜÚ.

(OR)

(b) Test whether the markov chain having the following transition matrix in regular and cryodic. When x represents some positive P_{ij} value.

	1	2	3	4
1	0	x	x	0
2	x	O	O	x
3	x	0	0	x
4	0	x	x	0

Á¡÷ì§¸¡ º í¸¢Ä¢ ¸£úì¸ñ¼ Á¡Ú¾ø «½¢¨Â ¿¨¼Ó¨ÈÂ¢Öõ, ±÷§¸ ¡Êì Ó¨ÈÂ¢ÂÖõ ¦ÀüÚûÇ¾¡ ±É ¬Ã¡ö¸. þíÌ x ±ýÀÐ º¢Ä Á¢¨¸ P_{ij} Á¾¢ôÒ¸¨Çò ¾Õõ

15 (a) A decision problem has been expressed in the following pay off table.

Activity	Out Come		
	I	II	III
A	10	20	26
B	30	30	60
C	40	30	20

(i) What is the minimum pay off action?
(ii) What is the minimum opportunity loss function?

´Õ ¾£÷¨Åì ¸½ì¸Ì ¸£úì¸ñ¼ Å¢Çì¸ «ð¼Å¨½ ãÄõ ±ÎòÐ¨Ãì¸ôÀÎ ¸¢ýÈÐ.

¦ºÂø	¦ÅÇ¢Â£Î		
	I	II	III
A	10	20	26
B	30	30	60
C	40	30	20

(i) Á¢¸ Ì¨ÈÅ¡É ¦ºÂø Á¾¢ôÒ ±ýÉ?
(ii) Á¢¸ì Ì¨ÈÅ¡É Å¡öôÒ þÆôÒÎ º¡÷Ò Â¡Ð?

(OR)

(b) Explain EOL.
EOL Å¢ÇìÌ¸.

SECTION – C **(5 X 12 = 60)**

16 (a) Find the optimum integer solution to the all integer programming problem.
Maximize $Z = x_1+x_2$
Subject to
$3x_1+2x_2 \leq 1$
$x_2 \leq 5$ $x_1,x_2 \geq 0$ and all integer
À¢ýÅÕõ ÓØ ±ñ¸û ¦ºÂø ¾¢ð¼ ¸½ì¸¢üÌ ¯ò¾Á ÓØ ±ñ ¾£÷× ¸¡ñ¸.

Á£ô¦ÀÃ¢Â¾¡ìÌ $Z = x_1+x_2$
¸ðÎôÀ¡Î¸û
$3x_1+2x_2 \leq 1$
$x_2 \leq 5$ $x_1,x_2 \geq 0$ and all integer

(OR)

(b) Find the optimum integer solution to the following all I.P.P.
Maximize $Z = x_1+2x_2$
Subject to
$x_1+x_2 \leq 7$
$2x_1 \leq 11$
$2x_2 \leq 7$ $x_1,x_2 \geq 0$ and all integers
À¢ýÅÕõ ÓØ ±ñ¸û ¦ºÂø ¾¢ð¼ ¸½ì¸¢üÌ ¯ò¾Á ÓØ ±ñ ¾£÷× ¸¡ñ¸.

Á£ô¦ÀÃ¢Â¾¡ìÌ $Z = x_1+2x_2$
¸ðÎôÀ¡Î¸û
$x_1+x_2 \leq 7$
$2x_1 \leq 11$
$2x_2 \leq 7$ $x_1,x_2 \geq 0$ and all integers

17 (a) Obtain the necessary and sufficient conditions for the optimum solution of the following L.P.P.
Minimize $Z = f(x_1,x_2) = 3e^{2x_1+1} + 2e^{x_2+5}$

Subject to the constraints
$x_1+x_2 = 7$ and $x_1,x_2 \geq 0$

À¢ýÅÕõ §¿÷ ¦¿Ã¢Â¢øÄ¡¾ ¸½ì¨¸ò ¾£÷ì¸ §¾¾¨ÅÂ¡É ÁüÚõ §À¡ ÐÁ¡É ¿¢Àó¾¨É¸¨Ç ¸¡ñ¸
Á£îº¢È¢Â¾¡ìÌ $Z = f(x_1,x_2) = 3e^{2x_1+1} + 2e^{x_2+5}$
¸ðÎôÀ¡Î¸û $x_1+x_2 = 7$ and $x_1,x_2 \geq 0$

(OR)

(b) Solve the following L.P.P.
Optimize $Z = 4x_1^2+2x_2^2+x_3^2-4x_1x_2$

Subject to the constraints

$x_1+x_2+x_3 = 15$

$2x_1-x_2+2x_3 = 20$ $\qquad x_1,x_2,x_3 \geq 0$

À¢ýÅÕõ §¿÷ ¦¿Ã¢Â¢øÄ¡¾ ¸½ì¨¸ò ¾£÷

$Z = 4x_1^2+2x_2^2+x_3^2-4x_1x_2$

¸ðÎôÀ¡Î¸û

$x_1+x_2+x_3 = 15$

$2x_1-x_2+2x_3 = 20$ $\qquad x_1,x_2,x_3 \geq 0$

18 (a) Use Dynamic Programming to show that

$Z = P_1 \log P_1 + P_2 \log P_2 + \ldots + P_n \log P_n$

Subject to the constraints

$P_1 + P_2 + P_3 + \ldots\ldots + P_n = 1$ and $P_j \geq 0$ (j = 1,2,3 …. n) is minimum where $P_1 = P_2 = P_3 = \ldots\ldots = P_n = 1/n$

(OR)

(b) Divide a positive quantity C into 'n' parts in such a way that their products is a maximum.

'c' ±ýÛõ Ó¸ «Ç¨Å ¦ÀÕì¸ø ÀÄý ´Õ Á¢¨¸Â¡¸ 'n' þÕì¸ìÜÊÂ Àì¾¢¸Ç¡¸ À¢Ã¢.

19 (a) Define statimay distribution. Obtain the limiting distribution of the three – state markov chain with transition probability matrix.

$$P = \begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.4 \\ 0.1 & 0.5 & 0.4 \end{bmatrix}$$

¿¢¨ÄÂ¡É ÀÃÅ¨Ä Å¨ÃÂÚ. ¸£úì¸ñ¼ Á¡Ú¾ø ¿¢¸ú¾¸× «½¢ìÌ ãýÚ Á¡÷ì§¸¡ º¡¸¢Ä¢Â¢ý ±ø¨Äô ÀÃÅ¨Ä Å¢ÅÃ¢.

$$P = \begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.4 \\ 0.1 & 0.5 & 0.4 \end{bmatrix}$$

(OR)

(b) Obtain P^n for the following transition probability matrix

$$P = \begin{bmatrix} 1-a & a \\ b & 1-b \end{bmatrix}, \quad 0 < a, \; b < 1$$

$$P = \begin{bmatrix} 1-a & a \\ b & 1-b \end{bmatrix}, \quad 0 < a, \; b < 1$$ ±ýÈ Á¡Ú¾ø ¿¢¸ú¾¸× «½¢Â¢ý ¸¡ñ¸.

20 (a) The Estimated sales of proposed types of perfumes are as under

Types of Perfumes	Estimated level of sales (Units)		
	Rs.20,000	Rs.10,000	Rs.20,000

A	25	15	10
B	40	20	5
C	60	25	5

(i) For each of the following decisions, state the optimal action and specify the value leading to its section : (a) Maximin (b) Maximax (c) Laplace (d) Minimax legret

(ii) What will be the optimal act if the pay off entries represent the costs instead of sales?.

Å¡º¨É ò ¾¢ÃÅ¢Âí¸Ç¢ý ±¾¢÷À¡÷ì¸ôÀð¼ Å¢¨ÄôÀðÊÂø ¸£§Æ ¦¸ ¡Îì¸ôÀðÎûÇÐ.

Å¡º¨É Å¨¸	Á¾¢ôÒ		
	Rs.20,000	Rs.10,000	Rs.20,000
A	25	15	10
B	40	20	5
C	60	25	5

(i) ¸£úì¸ñ¼ ¾£÷×¸ÙìÌ ¯ò¾Á ¦ºÂø¸¨Ç «¾ý ÀÌò¾È¢× Á¾¢ôÒ¸¨Ç (a) ¦ÀÕÁîº¢Ú (b) ¦ÀÕÁô ¦ÀÕ (c
(c) Ä¡ôÄ¡Š (d) º¢ÚÁô ¦ÀÕÓ¨È

(ii) Á¾¢ôÒ¸û Å¢üÀ¨ÉÌÎô À¾¢ø ¿¢¨ÄÂ¡¸ þÕÌÌõ§À¡Ð ¯ò¾Á¦ºÂø Â¡Ð?.

(OR)

(b) Consider the following pay off (profit) matrix.

	θ_1	θ_2	θ_3	θ_4
a_1	5	10	18	25
a_2	8	7	8	23
a_3	21	18	12	21
a_4	30	22	19	15

Solve this using Hurlicj Criterion with $\alpha = 0.75$.

¸£úì¸ñ¼ «½¢Â¢ý $\alpha = 0.75$-¨Â ¨ÅòÐ †÷Ä¢Š Ó¨È¨Â ÀÂýÀÎò¾¢ ¾£÷× ¸¡ñ.

	θ_1	θ_2	θ_3	θ_4
a_1	5	10	18	25
a_2	8	7	8	23
a_3	21	18	12	21
a_4	30	22	19	15