

BM-121

(Semester-II)

Number Theory And Trigonometry

External Marks: 40/27

Internal Marks: 10/6

Time: 3 Hours

Note: Paper setter will set nine questions in all, selecting two questions from each section and one Compulsory question consisting of five parts distributed over all four sections. Candidates are required To attempt five questions, selecting at least one question from each section and the compulsory Question.

Section-I

Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple) Primes, Fundamental Theorem of Arithmetic. Linear Congruences, Fermat's theorem. Wilson's theorem and its converse. Linear Diophantine equations in two variables

Section-II

Complete residue system and reduced residue system modulo m . Euler function Euler's generalization of Fermat's theorem. Chinese Remainder Theorem. Quadratic residues. Legendre symbols. Lemma of Gauss; Gauss reciprocity law. Greatest integer function $[x]$. The number of divisors and the sum of divisors of a natural number n (The functions $d(n)$ and $s(n)$). Moebius function and Moebius inversion formula.

Section-III

De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.

Section-IV

Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series

REFERENCES

- S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.
- R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.
- Ivan Ninen and H.S. Zuckerman. An Introduction to the Theory of Numbers.

BM-122

(Semester-II)

Ordinary Differential Equations

External Marks: 40/27

Internal Marks: 10/6

Time: 3 Hours

Note: Paper setter will set nine questions in all, selecting two questions from each section and one Compulsory question consisting of five parts distributed over all four sections. Candidates are required To attempt five questions, selecting at least one question from each section and the compulsory Question.

Section-I

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x, y, p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

Section-II

Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves.. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous

Section-III

Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.

Section-IV

Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators $x (d/dx)$ or $t (d/dt)$ etc. Simultaneous equation of the form $dx/P = dy/Q = dz/R$. Total differential equations. Condition for $Pdx + Qdy + Rdz = 0$ to be exact. General method of solving $Pdx + Qdy + Rdz = 0$ by taking one variable constant. Method of auxiliary equations.

REFERENCES

- D.A. Murray : Introductor y Course in Differential Equations. Orient Longaman (India) . 1967
- A.R.Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
- E.A. Coddington : Introduction to Differential Equations.
- S.L.Ross: Differential Equations, John Wiley & Sons
- B.Rai & D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd

BM-123
(Semester-II)
Vector Calculus

External Marks: 40/27

Internal Marks: 10/6

Time: 3 Hours

Note: Paper setter will set nine questions in all, selecting two questions from each section and one Compulsory question consisting of five parts distributed over all four sections. Candidates are required To attempt five questions, selecting at least one question from each section and the compulsory Question.

Section-I

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.

Section-II

Gradient of a scalar point function, geometrical interpretation of $\text{grad } F$, character of gradient as a point function. Divergence and curl of vector point function, characters of $\text{Div } f$ and $\text{Curl } f$ as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.

Section-III

Orthogonal curvilinear coordinates Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors. Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates, Cylindrical co-ordinates and Spherical coordinates

Section-IV

Vector integration; Line integral, Surface integral, Volume integral Theorems of Gauss, Green & Stokes and problems based on these theorems.

REFERENCES

- Murraray R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
- Murraray R. Spiegel : Vector Analysis, Schaum Publisghing Company, New York.
- N. Saran and S.N. Nigam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
- Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.