

SYLLABUS, TDC-III
RAMESHWAR MAHAVIDYALAYA, B. R. A. B. U, MUZAFFARPUR

MATHEMATICS (HONS.) PAPER-V

Time: 3 hr

Full Marks: 100

Group-A

Function of two variables, limit, double limit, repeated limits, Moore-Osgood theorem. Continuity of a function of two variables, Differentiability, Sufficient condition for the differentiability, Young's and Schwarz's theorems on the equality of f_{xy} and f_{yx} . Implicit function, Implicit function theorem, Inverse function theorem. Taylor's theorem for a function of two variables, Maxima and Minima of a function of two variables, Lagrange's method of undetermined multipliers.

Group-B

Definition of Riemann integral of bounded function, bound definition and limit definition, their equivalence, Riemann integrability of a continuous function and monotonic functions, Riemann integrability of function with finite number of discontinuities, Fundamental theorem of integral calculus, Mean value theorem, Definition of Riemann-Stieljes integral of a bounded functions and its simple properties.

Improper integrals and their convergence, Comparison tests, Dirichlet's test, Beta and Gamma functions and their properties and relationship, Differentiation under integral sign.

GROUP-C

Definition of uniform convergence of sequences and series of functions, Cauchy's principle for uniform convergence of sequence of functions, Point wise convergence, Uniform continuity, Dini's theorem, term by term differentiation theorem, term by term integration theorem, Weierstrasses M-test, Abel's test, Dirichlet's test

Books:

- (1) Advanced mathematical Analysis Chatterjee U.
- (2) Advanced differential calculus of several variables: Mukherjee S.
- (3) Topics in real analysis: Mukherjee S.

MATHEMATICS (HONS.) PAPER-VI

Time: 3 hr

Full Marks: 100

Group A

Group Theory: Centre, Normalizer, Conjugacy, class equation, Cauchy's and Sylow's theorems, Automorphisms, Inner automorphisms, Direct product of two groups. (Four questions)

Group B

Rings: Division ring, polynomial ring, imbedding of a ring without unity in a ring with unity, Imbedding of a ring and integral domain in a field, Characteristics of a field, field quotients, Polynomial over commutative ring, prime and maximal ideals in cumulative rings. (Four Questions)

GROUP C

Linear Algebra: Vector spaces, Sub-spaces, bases and dimensions, linear transformations and their algebra, Matrices and linear transformations, rank and nullity of a linear transformation.

Dual spaces, transpose of a linear transformation, direct sum of sub spaces, characteristic values, characteristic vectors, Cayley-Hamilton theorem. (Four Questions)

Books:

- (1) Abstract Algebra: Bhattacharyya R.

MATHEMATICS (HONS.) PAPER-VII

Time: 3 hr

Full Marks: 100

Group A

Statics: Moment of inertia, definition and standard results, momental ellipsoid, parallel and perpendicular axes theorems, principal axes of inertia, its existence, at a point, determination of principal axes of inertia, equimomental systems. (Four Questions)

Dynamics: Angular momentum and kinetic energy of a rigid body rotating about a fixed point, kinetic energy of a rigid body in general motion. Principle of linear momentum, angular momentum and energy of a rigid body, D'Alembert's principle, general equations of motion of a rigid body, Motion about a fixed axis, compound pendulum. (Four Questions)

Group B

Attraction and Potential: attraction and potential of rods, circular discs, spherical shells, sphere (Laplace's and Poisson's equations), Theorem on equipotential surfaces. (Two Questions)

Hydrostatics: Pressure at a point, equilibrium of fluids under given system of forces, Centre of pressure, equilibrium of floating bodies. (Two Questions)

GROUP C

Differential equations: Second order equations with variable coefficients, methods of variations of parameters.

Total differential equations in three independent variables, Simultaneous differential equations, Lagrange's linear partial differential equations, standard forms, Charpit's method, Monge's method. (Four Questions)

Books:

- (1) Analytical statics: Pradhan S. and Sinha S.
- (2) Advanced analytical Dynamics: Dynamics of rigid body: Chatterjee U.

MATHEMATICS (HONOURS) PAPER VIII

(Spherical Astronomy)

Time: 3 hr

Full Marks: 100

Courses: Spherical triangle, fundamental formulae sine, Cosine, Sine-Cosine, Cotangent, Napier's and Delambre's angles, Right angle triangle and Napier's rule, Celestial sphere, Different system of coordinates, Rising and setting of stars, Twilight, Transit instruments, errors and their corrections, Kepler's law of motion, anomalies and their relations, Kepler's equation, Refraction, Simpson's, Bradley's and Cassini's formulae, effect of refraction on the position of a body, Annual aberration, effect of aberration on (i) latitude and longitude (ii) on right ascension and declination, Parallax, effect of parallax on (i) Latitude and longitude (ii) on right ascension and declination

MATHEMATICS (HONOURS) PAPER-VIII

(Numerical Analysis)

Time: 3 hr

Full Marks: 100

Courses: Finite, Central and Divided differences, interpolation, Inverse Interpolation, Numerical differentiation, Numerical integration, Trapezoidal, Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule, Weddle's rule, Gauss's quadrature formula of integration, Gregory's formula and the Euler-Maclaurin's formula

Solution of differential equation of the first order, general equations, Linear differential equations with constant coefficients, Solution of ordinary differential equations-one step methods: Euler's modified, Picard's Runge-Kutta's methods, Method of starting the solution and continuing the solution, Adam's, Adam's-Bashforth-Milive

Simultaneous linear equation: Gauss elimination, Gauss Seidel, Jordan's and Relaxation methods (simple problems)

Finding roots of polynomial equations, Regula Falsi Bisection, Newton-Raphson method for several variables, Iterative methods and its generalisations, Chebyshev's Bigre-vieta, LinBoristowGraffer root squaring method and their convergence.

Significant figures and error of computations. Nomograms.

MATHEMATICS (Honours) Paper VIII

(Probability Theory)

Time: 3 hr

Full Marks: 100

Courses: Probability spaces, Finite probability space, Conditional probability, Bay's theorem, Random variables, Mathematical expectation and moments, Joint distributions, Independent random variables, convergence of a sequence of random variables, convergence in distributions, convergence in probability, almost sure convergence, convergence in quadratic mean, Halley Bery theorem, Complexed value random variables characteristics functions, Inversion theorem continuity theorem, Distribution of X and S . Kolmogorov's inequality, Weak and strong law of large numbers.

MATHEMATICS (Honours) Paper VIII

(Theory of Numbers)

Time: 3 hr

Full Marks: 100

Courses:The basic representation theorem, Linear Diophantine equations, Fundamental theorem of Arithmetic Fermat's Little theorem Wilson theorems.
Basic properties of Congruences, Residue System, Euler's Theorem, Chinese Remainder theorem Multiplicative Arithmetic functions, the functions $u(n)$ d and their simple properties. Mobius inversion formula, Primitive roots, Modulations.
Elementary properties of (x) Legendre's formula for the highest power of a prime number that divides n . Statement of prime number theorem, Euler's criterion for quadratic residue the Legendre symbol the quadratic reciprocity law and its applications.
Sums of two and four squares Fermat conjecture Graphical representation of partitions. Euler's partition theorem