GHS 21

Geometry & Vector Calculus

(Number of Teaching hours:80;   Time: 3hrs;   Marks:100)
(To answer five questions, choosing one out of two questions from each unit)

UNIT I : Change of axes – invariants; pairs of straight lines; general equation of second degree; the standard form; reduction of the general equation to standard form; conditions for different conics; General conics : equations of tangents, normals, pairs of tangents, chord of contact, chord in terms of middle points, pole, polar, conjugate lines, diameter, asymptotes.

UNIT II: Polar equation, equation of a conic, directrix, chord, tangent and normal; parabola, ellipse, hyperbola; conjugate diameters of ellipse and hyperbola; rectangular hyperbola; conjugate hyperbola. Space co-ordinates: rectangular, cartesian, cylindrical, spherical, and polar; equation of planes; angle between two planes; perpendicular distance of a point from a plane;

UNIT III : Equations of straight lines in space; co-planarity of two straight lines; perpendicular distance of a point from a straight line; shortest distance between two straight lines in space; Sphere – plane section and its equation; sphere through a given circle; tangent plane; pole and polar plane; intersection of two spheres; Equation of a cone with a conic as a guiding curve; enveloping cone; mutually perpendicular generators; tangent planes; reciprocal cone; right circular cone; equation of a cylinder with a conic as a guiding curve; right circular cylinder.

UNIT IV : Products (scalar and vector products) of two, three and four vectors – properties, geometrical significance and applications; Vector valued functions (up to 3 variables); derivatives of such a function of a single variable; properties and geometrical applications; arc length, unit tangent vector; curvature, normal vector; derivatives of scalar and vector products;

UNIT V: Velocity and acceleration in cartesian co-ordinates, radial and transverse accelerations on smooth curves (simple problems only), tangential and normal components of velocity and acceleration. Directional derivatives, gradient of a scalar- valued function, tangent planes; vector fields, curl and divergence of a vector field, Physical and geometrical interpretation and elementary properties.

Books

Text Books:
1. Das. B.: Analytical Geometry and vector Analysis, Orient Book Co., Calcutta, 1998 Edition.
2. Narayan S.: Analytical Solid Geometry, S. Chand & Co., New Delhi, 2003 Edition.
3. Thomas, G. B., and Finney, R. L.: Calculus and Analytic Geometry, Narosa Publishing House, 2002 edition.
4. Narayan, S. and Mittal, P. K.: A Text Book of Vector Analysis, S. Chand & Co. Ltd., New Delhi, 2003 Edition.
6. Chorlton, F.: Text Book of Dynamics, CBS Publishers and distributors, Delhi, 2002 Edition.
7. Chatterjee, D.: Vector Analysis, PHI Learning Pvt Ltd. New Delhi, 2002 Edition.
8. Ghosh, R. K. and Maity, K. C.: Vector Analysis, New Central Book Agency, 2001 Edition.

Reference Book
1. Stewart, J.: Essential Calculus Early Transcendentals, Thomson Brooks/Cole, USA, 2007 Edition.

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ʋ₁ ...mation of differential equations; equations of first order and first degree; solutions by separation of variables, by substitution; homogeneous equations; linear equations; Bernoulli's equation; exact equations; reduction to exact form by integrating factors; differential equations of first order but higher degrees; Clairut's equation and singular solution; geometrical interpretation applications of first order differential equations to geometric and physical problems (simple cases only) including orthogonal trajectories'

Books

Text Books:

1. Bhattacharya, P. B., Jain, S. K., and Nagpaul, S. R. : Basic Abstract Algebra, Cambridge Press, 1995   Edition.
2. Saikia, P. K.: Linear Algebra, Pearson. Delhi. 2009 Edition.
3. Maity, K. C. and Ghosh, R. K. : Differential Calculus, New Cental Book Agency Pvt Ltd., 2001 edition.
4. Das, B.C. and Mukharjee, B.N.. Calculus . UN Dhar and Sons Publisher.
5. Thomas. G. B.. and Finney. R. L. : Calculus and Analytic   Geometry. Narosa Publishing House, 2002 Edition.

Reference Books

1. Fraleigh, J. B.: A First Course in Abstract Algebra, Narosa   Publishing House, 1999 Edition.
2 Stewart. J.: Essential Calculus Early Transcendentals. Thomson Brooks/Cole. USA. 2007 Edition.

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