NOTE: Each section having four questions, please attempt two questions from each section.

SECTION-I (4/12: 17,17,17,17)

Vectors in three-dimensions. Scalar and vector products with applications. Scalar and vector triple products. Differentiation and integration of vector functions. Gradient, divergence and curl. Differential operators. Application to vector analysis. Composition and resolution of co-planar forces. (,) Theorem, Lamy's Theorem, Varignon's Theorem, Moments, couples and conditions of equilibrium under the action of co-planar forces.

SECTION-II (4/12: 16,16,16,16)

Types of forces, Direction of forces of constraints, Equilibrium of three co-planer forces and related problem. Center of gravity. Symmetry and Center of mass, Center of mass of various bodies. Frictional forces. Laws of friction. Equilibrium of bodies on rough surfaces. Principle of virtual work and related problems.

SECTION-III (4/12: 17,17,17,17)

Kinematics of a particle in Cartesian and polar co-ordinates. Laws of mechanics. Linear and angular velocity. Relative velocity. Rectilinear motion with uniform and variable acceleration. Simple harmonic motion. Projectile motion. Motion along horizontal and vertical circles. Orbital motion. Elliptic orbit under a central force, Polar form of the orbit, Apse and Apsidal Distance, Planetary motion and Keplar's laws.

Recommended Books.
1. Theory of Differential Equations of Dennis G.Zill. Books Thomson Learning Academic Resource Center. USA. 8th Edition 2013
2. Mathematical Techniques by K.H. Dar, Irfan-ul-Haq and M.A. Jajja. The Carvan Books House. Kachehry Road, Lahore. 9th Edition 1997
3. Mathematics Methods by S.M. Yousaf. Illmi Kitab Khana. Urdu Bazar, Lahore. 1998
4. Numerical Analysis by R.L. Burden and J.D. Faires. PES-Kent Publishing Company. Bostan. USA 9th Edition 2011
5. Operations Research by H.A. Taha. Prentice-hall Inc. Englewood. Cliffs USA.4th Edition 2011
6. Mathematical Statistics. By Dr. J.E.Freund. Prentice-hall Inc. Englewood. Cliffs USA. 7th Edition 2007
7. Vector and Tensor Methods, by Chorlton, Ellis Horwood Publishers.1976
8. Elementary Vector Analysis. By Dr. Munawar Hussain. S.M. Hafeez. M.A. Saeed and Ch. Bashir Ahmed. The Caravan Book House, Kachhry Road , Lahore.
9. A Text Book by Dynamics by Chorlton, Van Nostrand Company Ltd. London. 1967
10. Mechanics by O.K. Ghori. West Pakistan Publishing Company, Lahore. 1971