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MANIPAL UNIVERSITY, MANIPAL

FIRST SEMESTER M.Sc(PHYSICS) END SEMESTER EXAMINATION, JANUARY, 2016

SUB: CLASSICAL MECHANICS (PHY- 603) (REVISED CREDIT SYSTEM)

TIME: 3 HRS.

MAX.MARKS: 50

NOTE: (A) ANSWER ANY FIVE FULL QUESTIONS. (B) EACH QUESTION CARRIES 10 MARKS.

1A	Discus the nature of the projectile trajectory under resistive force.	[5]
1B	Prove that the angular momentum of a system of particles about a fixed point is equal to the sum of the angular momentum of total mass concentrated at the cen of mass about that point and the angular momentum of the system about its cent mass.	tre re of [5]
2A	Assuming the equation of motion of a body in a two-body system in conservative central field, obtain the equation the equation of the orbit in inverse-square-law field	eld. [5]
2B	Obtain the Lagrange's equation for the general force field from D Alembert's principle.	[5]
3A	Obtain Hamilton's canonical equations of motion.	[5]
3B	Obtain expressions for angular velocity components of a rigid body rotation in terr of angular momentum and kinetic energy.	ms [5]
4A	Use Lagrangian formulation to get equations of motion of a bead sliding along a uniformly rotating wire in a force-free space.	[4]
4B	Prove that (i) $\frac{\partial q_j}{\partial Q_k} = \frac{\partial P_k}{\partial p_j}$ (ii) $\frac{\partial q_j}{\partial P_k} = -\frac{\partial Q_k}{\partial p_j}$ (iii) $\frac{\partial p_j}{\partial Q_k} = -\frac{\partial P_k}{\partial q_j}$ in the case of point canonical transformations.	[6]
5A	Prove that poisson brackets are invariant under canonical transformations.	[4]
5B	Obtain the stress tensor elements and the strain tensor elements in terms of free energy and Gibbs function.	[6]
6A	Obtain the equation of continuity for mass densities.	[5]
6B	State and prove Bernoulli's theorem.	[5]