

MANIPAL UNIVERSITY, MANIPAL

FIRST SEMESTER M.Sc(PHYSICS) END SEMESTER EXAMINATION, DECEMBER, 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	A projectile motion in a resistive medium is described by $x = \frac{U}{k} (1 - e^{-kt})$ and $y = -\frac{gt}{k} + \frac{kV+g}{k^2} (1 - e^{-kt})$, where $x = U, y = V$ when $t = 0, k =$ resistive force per unit velocity per unit mass. Obtain an expression for its range of flight when the air resistance is small. [6]	
1B	Obtain the general expression for kinetic energy in the case of a double pendulu terms of generalized coordinates.	m in [4]
2A	Discuss the general features of motion of a body in a two-body system in a conservative central force field with arbitrary potential energy values.	[5]
2B	How does a two-body problem reduce to a one-body problem in a central force f Explain.	ield? [5]
3A	Obtain Lagrangian for a spherical pendulum and hence obtain the equations of motion.	[5]
3B	Obtain the expressions for the angular velocity components (ω_3 & A) of a rigid be rotation in terms of angular momentum and kinetic energy.	ody [5]
4A	Using variational principle, obtain the path of a particle moving in minimum trans time, in a conservative force field, starting from rest.	it [5]
4B	Explain stress tensor.	[5]
5A	In the case of oscillations in 2 coupled simple pendulums, obtain the expressions normal coordinates. Find the expressions for the case of (i) bobs displaced by in the same direction, (ii) bobs displaced by q_0 in opposite directions, and released at t=0.	
5B	Obtain the canonical equations of motion in terms of poisson bracket notation. Prove that poisson bracket of 2 constants of motion is itself a constant of motion [state & prove Poisson's theorem].	[6]
6A	Obtain an expression for the speed of elastic waves in isotropic elastic media.	[5]
6B	Obtain an expression for the group speed of ripples on water surface.	[5]