Roll No. .....

Total No. of Questions : 9] [Total No. of Printed Pages : 4

(2042)

UG (CBCS) Ist Year Annual Examination

2007

B.Sc. PHYSICS

(Mechanics)

(Core)

Paper : PHYS 101 TH

Time : 3 Hours] **[Maximum Marks : 50**

Note :– Attempt *five* questions in all, selecting *one* question each from Sections B, C, D and E. Question No. 1 (Section A) is compulsory.

Section–A

(Compulsory Question)

1. (i) Differentiate between linear and non-linear differential equations.

   (ii) What are left handed and right handed co-ordinate systems ?

(iii) What do you mean by homogeneity of space ?

(iv) What is non-inertial frame of reference ?

(v) What is a turning point of a body moving under central force field ?

(vi) What is angular momentum ? Give its S.I. unit.

(vii) What is the final result of Michelson-Morley experiment ? 2×7=14

Section–B

2. (a) Derive an expression for the velocity of a particle moving in a plane in polar co-ordinates.

(b) Motion of a particle is described by the equation $x = 4 \sin 2t$, $y = 4 \cos 2t$, $z = 6t$. Find velocity and acceleration of the particle. 5,4

3. (a) What is Coriolis Force ? Derive an expression for it.

(b) Prove that homogeneity of time leads to law of conservation of energy. 5,4

Section–C

4. (a) Obtain equation of motion for equivalent one body problem for two masses. Also explain the concept of reduced mass.

(b) State and explain Kepler's first law of planetary motion. 5,4

5. (a) What do you understand by central and non-central forces ? Establish the differential equation of motion under central force and deduce its solution.

(b) Show that the angular momentum of a particle moving under a central force is constant. 5,4

Section–D

6. (a) What do you mean by Torque ? Derive its expression along three axes. What is the physical meaning of torque ?

(b) Derive the relation between torque and angular momentum. 5,4

7. (a) Explain the laboratory and centre of mass system. Discuss the elastic collision between two particles in the lab system.

(b) Prove that the kinetic energy of the system in centre of mass frame is always less than kinetic energy in the laboratory frame. 5,4

Section–E

8. (a) What was the essential aim of Michelson-Morely experiment ? Discuss the significance of the result obtained.

(b) Discuss the postulates of Einstein's special theory of relativity. 5,4

9. (a) Derive the formula for relativistic variation of mass with velocity.

(b) At what speed a particle is moving, if its mass is equal to four times its rest mass ? 5,4