Roll No. .....

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

(2034)

UG (CBCS) Ist Year Annual Examination

2707

B.Sc. PHYSICS

(Mechanics)

(Core)

PHYS–101

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

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

Section–A

(Compulsory Question)

1. (i) What is an ordinary differential equation ?

(ii) Is Gravitational force conservative or not ?

(iii) Name the fictitious forces which appear due to the rotation of earth.

(iv) What is a non-central force ? Give some characteristics of non-central force.

(v) Define torque and its units.

(vi) Define uniform circular motion.

(vii) The concept of length contraction is not observed in daily life. Explain, Why ? 2×7=14

Section–B

2. (a) Starting from the expression for velocity :

$$\vec{v} = \dot{r}\hat{e}_r + r\dot{\theta}\hat{e}_\theta + r\sin\theta\dot{\phi}\hat{e}_\phi$$

obtain an expression for acceleration in spherical polar co-ordinates, where letters have their usual meanings.

(b) Define solid angle. Show that the solid angle subtended by a sphere at its centre is 4π Steradian. 5,4

3. (a) Show that the principle of homogeneity of time leads to conservation of energy.

(b) Discuss some geographical and other consequences of coriolis force. 5,4

Section–C

4. (a) Show that the energy of reduced mass under central force field in constant or conserved.

(b) Define central and non-central forces. Give their characteristics. 5,4

5. (a) Discuss the various forces that exist in nature.

(b) What are the main segments of Global Positioning System ? List the various applications of GPS. 5,4

Section–D

6. (a) What is Rutherford Scattering ? Obtain an expression for the scattering cross-section for Rutherford Scattering.

(b) What do you mean by Laboratory and centre of mass Co-ordinate Systems ? 6,3

7. (a) Show that in C.M. System, the magnitude of the velocities remain unaltered in an elastic collision.

(b) Two bodies of masses 5g and 15g have position vectors $3\hat{i}+2\hat{j}-\hat{k}$ and $\hat{i}-\hat{j}+3\hat{k}$ respectively. Find the position vector and the distance of centre of mass from origin. 5,4

Section–E

8. (a) Discuss Michelson-Morley experiment. What conclusions can be drawn from it regarding the existance of ether ?

   (b) Discuss the postulates of Einstein's special theory of relativity. 6,3

9. (a) Discuss the Length-contraction and time variation on the basis of Lorentz's transformation.

   (b) Derive mass energy relation. 6,3