B.Sc. 1st Semester Examination

BS-IS/9

224477

PHYSICS

Course No.: 101

Maximum Marks: 80 Time Allowed: 3 hours

Note :- There shall be 10 questions with 2 questions from each Unit. Students have to select one question from each Unit. Total no. of questions candidates have to attempt is 5.

Unit I

1. (a) Find velocity and acceleration of a particle in case of spherical polar coordinates 12

(b) The motion of a particle is given by x = 56 - 9, y = 2 cos 31, 2 = 2 sin 3t. Find the magnitude of velocity and acceleration of the particle.

2. (a) Derive, expressions for unit vectors in cylindrical coordinate and prove that they are mutually perpendicular to each other. 10

(b) Discuss Geographical effects of Coriolis force.

Unit 11

3. (a) Prove that in COM system, the magnitude of the velocities of the particles do not change in elastic collisions.

(b) Prove that angular momentum of reduced mass under the effect of the central force is conserved.

4. (a) Define central and non-central forces. Derive the differential equation of the orbit. 10

(b) State Kepler's laws of planetary motion and derive Kepler's third law.

Unit III

5. (a) Derive expressions for differential equation and time period in case of Bifilar pendulum. https://www.jktopper.com 10

(b) Calculate the energy possessed by a stone of mass 20 gm executing S.H.M of amplitude 1 cm and time period 4 seconds.

6. (a) Define the following terms in case of damped harmonic oscillator:

(i) Relaxation time

(ii) Logarithmic decrement

and derive expression for them. 10

(b) Discuss power dissipation in a damped harmonic oscillator. 6

Unit IV

7. What is a driven oscillator ? Discuss transient and steady state behaviour of forced oscillator.

8. (a) Show that average power supplied by the driving force to the oscillator is equal to the average power dissipated against frictional force. 10

(b) Find the resonant frequency of ckt. having L = 1 mH. C = 0.1 uF and R - 10 22. Also calculate band width and quality factor of ckt. 6

Unit v

9. Derive Lorentz transformation equations for two inertial frames and apply these to explain length contraction. 16

10. (a) Deduce the mass-energy relation E = mc2 Give significance of this relation.

10

(b) An electron is accelerated through a potential difference of 1.8 x 106 V. Find the relativistic mass of the electron. Given me = 9 x 10-31 kg.