DEPARTMENT OF PHYSICS

QUESTION BANK

B.Sc. Part-I, Semester-I, PHYSICS Paper- II

DSC- 2A MECHANICS - II

❖ Long answer questions

1. Obtain the expression for period of a satellite in a circular orbit round the earth.

2. Show that for a motion of particle in central force field, angular momentum is conserved and areal velocity remains constant.

3. Show that a square of period of revolution of satellite is directly proportional to the cube of the orbital radius.

4. State Newton's law of gravitation and define the universal constants of gravitation derive its dimensions.

5. Discuss the launching of satellite in a circular orbit and give its applications.

6. What do you mean by damped oscillations? Set up differential equation for damped oscillator and obtain its solution. Discuss various cases depending upon relative values of restoring force and damping force.

7. What are damped oscillations? Set up differential equation for damped oscillator and obtain the solution for it. Explain how the amplitude and frequency of oscillator are affected.

8. What are forced oscillations? Set up differential equation for forced oscillator in presence of damping and obtain its solution. Discuss how the amplitude and frequency of oscillator are affected by the applied periodic force.

9. Set up the differential equation for SHM and hence obtain the expression for displacement(x), velocity (υ) and acceleration of the particle executing SHM.

10. What are forced oscillations? Set up differential equation for same and obtain its solution.

11. Set up the differential equation for SHM and then obtain the solution for the same and explain the physical significance of angular frequency (ω), amplitude (a) and initial phase (α)

12. Write down differential equation for SHM and hence obtain the expression for displacement (x), velocity (υ) and acceleration of the particle executing SHM and represent them graphically.

13. Derive the expression for bending moment of horizontal beam fixed at one end and loaded at the other.

14. Assuming a general expression for bending moment of a horizontal beam fixed at one end and loaded at the other, derive expression for the same when the cross section of beam is (i) rectangular and(ii) circular.

15. What is meant by (i) torsion, (ii) torsional oscillation? Derive an expression for the torsional couple per unit angular twist in case of a wire.

16. Show that torsional oscillations are angular simple harmonic. Hence, obtain an expression for the time period of oscillation and explain how the modulus of rigidity of the material of a wire can be determined by torsional oscillation method.

17. Obtain an expression for Y, η and σ for material of wire using Searle's method.

18. Show that the excess pressure on the concave side of a curvilinear surface of a liquid is $2T [(1/r1) + (1/r2)]$, r1 and r2 are the radii of curvature and T is the surface tension of liquid.

19. Derive the relation between surface tension, pressure and curvature. Hence, show that the excess pressure inside a soap bubble of radius r is $4T/r$.

20. Define surface tension. What is mean by angle of contact and wettability on the basis of molecular forces.

❖ Short answer type questions

21. State Kepler's law of planetary motion.

22. What is mean by central force?

23. Give the applications of satellite.

24. Explain the geosynchronous orbits and geostationary satellite.

25. Explain why the astronaut in an orbiting satellite experiences a feeling of weightlessness.

26. Write a note on Global positioning system.

27. Define S.H.M. Explain the terms amplitude, period, frequency, phase and phase constant of particle.

28. Obtain the expression for average of P.E.($\bar{U}$), and average K.E.(K) of a particle executing SHM.

29. Obtain the expression for P.E.(U) and average P.E.(U) and average P.E.($\bar{U}$) of a particle performing S.H.M.

30. Define S.H.M. Deduce the differential equation of Simple harmonic motion.

31. Derive the expression for P.E.(U), K.E.(K) and total energy (E) of a particle performing S.H.M.

32. What is mean by free oscillations, damped oscillations and forced oscillations.

33. What is cantilever? Derive the expression for a depression of the free end of a cantilever due to load.

34. Write a note on torsional oscillation.

35. Derive the expression for a depression of .the centrally loaded beams supported at both the ends.

36. Describe the method to determine Young's modulus of material of a bar by bending of the bar.

37. Obtain an expression for work done in twisting a wire.

38. What is surface tension? Explain it on the basis of molecular forces.

39. What do you understand by 'angle o contact'? Derive the condition for the angle of contact to be acute or obtuse.

40. Explain wettability on the basis of angle of contact and also on the basis of cohesive and adhesive forces.

41. Describe the Jaeger's method to determine surface tension of liquid.

42. State and explain some applications of surface tension.