



Reg. No. :

Name :

Second Semester B.Sc. Degree Examination, July 2017
(First Degree Programme Under CBCSS)
Physics
Foundation Course – II
PY 1221 : CLASSICAL MECHANICS
(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences. **Each** question carries **one** mark.

1. State Newton's third law.
2. Write down the equation of motion of charged particle in a crossed electric and magnetic field.
3. Define bounded force.
4. State Kepler's first law.
5. Write down the polar equation of a parabola.
6. What is reduced mass ?
7. What is elastic scattering ?
8. Define probability of elastic scattering.
9. What is configuration space ?
10. Give two examples for constrained motion.

(10×1=10 Marks)



SECTION - B

Answer **any eight** questions **not** exceeding in **a paragraph**. Each question carries **two** marks.

11. Distinguish between inertial mass and gravitational mass.
12. Derive equation of motion under a force dependent on time only.
13. State Newton's first law and show that it assumes the properties of free space along a straight line.
14. Compare C. M. system and lab system.
15. In what respect elastic scattering differ from inelastic scattering ?
16. Compare displacement and velocity in lab and C. M. systems.
17. Write a note on principle of virtual work.
18. Differentiate holonomic and non-holonomic constraints with examples.
19. Write a note on conservation laws.
20. Write a note on symmetry operation in Lagrangian.
21. Explain the motion of the system of particles.
22. When force field is said to be conservative ?

(8×2=16 Marks)

SECTION - C

Answer **any six** questions. Each question carries **four** marks.

23. Three particles of masses 1, 2, 3 units move under the influence of a force field so that their position vectors relation to a fixed coordinate (t is time) system are given respectively by

$$r_1 = 2t \mathbf{i} - 3\mathbf{j} - t^2\mathbf{k}$$

$$r_2 = (t + 1)\mathbf{i} - 3t\mathbf{j} - 4\mathbf{k}$$

$$r_3 = t^2\mathbf{i} - 2\mathbf{j} - (2t - 1)\mathbf{k}$$

Calculate total angular momentum of the system.

24. Derive Kepler's law of period.



25. Apply Lagrangian in simple pendulum and obtain the time period.
26. A particle of mass m_1 moving with velocity u_1 is elastically scattered from another particle of mass m_2 at rest. After the collision, the two particles move in opposite directions with same speed. Find the mass of the target in terms of the mass of the incident particle.
27. Explain homogeneity of flow of time.
28. Compare Newtonian and Lagrangian mechanics.
29. State Kepler's first and second laws.
30. If centre of mass of three particles of masses 1, 2 and 3 g be at a point $(1, -2, 3)$ then where should a fourth particle of mass 4 g should be placed so that combined centre of mass will be at the point $(1, 1, 1)$?
31. Write a note on cross section of elastic scattering. (6×4=24 Marks)

SECTION - D

Answer **any two** questions. **Each** question carries **fifteen** marks.

32. Define Newton's third law. Show that angular momentum is constant for motion under central force.
 33. Explain the motion of a projectile in a resistive medium.
 34. Derive Lagrangian equation from D'Alembert's principle.
 35. Explain the kinetic energies in the lab and C. M. systems. (2×15=30 Marks)
-