LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**U.G.** DEGREE EXAMINATION – **PHYSICS**

SECOND SEMESTER – **APRIL 2012**

# PH 2503/2501/2500 - MECHANICS

 Date : 04-11-20112 Dept. No. Max. : 100 Marks

 Time : 1:00 - 4:00

**PART – A**

Answer **ALL** the questions: 10 × 2 = 20 Marks

1. Define centre of mass.
2. State the principle of Rocket propulsion.
3. What is the condition for the equilibrium of a system of coplanar forces acting on a rigid body?
4. What will be the centre of gravity of a body at the centre of the earth?
5. State Torricelli’s theorem.
6. What is meant by Transpiration?
7. What are constraints? Also mention their role in the motion of a mechanical system.
8. State and explain the principle of virtual work.
9. Define Gravitation constant.
10. What is meant by Parking orbits?

**PART – B**

Answer any **FOUR** questions: 4 × 7.5 = 30 Marks

11. (a) What is a torsional pendulum? (2)

 (b) How would you use it to find the rigidity modulus of a wire? (5.5)

12. (a) Define centre of gravity. (2)

 (b) Find the position of centre of gravity of a solid tetrahedron. (5.5)

 13. (a) Describe the working of a Pitot’s tube. (5)

 (b) A Pitot’s tube is fixed to a water pipe of diameter 8cm and the difference of pressure

 indicated by the gauge is 3cm of water column. Find the volume of water flowing per

 second through the pipe. (2.5)

14. (a) State and prove the laws of conservation of linear momentum and angular momentum for

 a system of interacting particles. (2+3)

 (b) Write a note on generalized coordinates. (2.5)

15. (a) State Kepler’s laws of planetary motion. (3)

 (b) Deduce Newton’s law of gravitation from Kepler’s laws. (4.5)

**PART – C**

Answer any **FOUR** questions: (4× 12.5 = 50 Marks)

16. (a) Derive an expression for the period of oscillation of a compound pendulum and show

 that the centre of suspension and the centre of oscillation are interchangeable. (6+3)

 (b) How would you determine g using a compound pendulum? (3.5)

 17. (a) Define centre of pressure. (3)

 (b) Determine the position of centre of pressure for a rectangular lamina immersed vertically

 in a liquid with one edge in the surface of the liquid. (7.5)

 (c) Find the position where the thrust acts on the rectangular end of a tank of width 1.5m

 and depth 0.5m filled completely with water. (2)

18. (a) State Bernoulli’s theorem. (2)

 (b) Describe a Venturimeter and explain its working. (2.5+5)

 (c) The diameter of the throat of a Venturimeter is 0.05m. When it is inserted in a

 horizontal pipe line of diameter 0.09m, the pressure difference between the pipe and

 the throat equals 0.07m of water. Calculate the rate of flow. (3)

19. State D’Alembert’s principle and hence derive Lagrange’s equations of motion for a holonomic conservative system. (3+9.5)

20. (a) What is escape velocity? (2)

 (b) Derive an expression for the escape velocity. (6.5)

 (c) Write a note on weightlessness. (4)

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