

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

SECOND SEMESTER – APRIL 2010

PH 2501 - MECHANICS

(UP TO 2007 BATCH)

Date & Time: 20/04/2010 / 1:00 - 4:00 Dept. No.

Max. : 100 Marks

PART – A

Answer ALL questions:

(10x2=20 Marks)

1. What is a compound pendulum?
2. Find out the rigidity modulus of a wire, 1m in length, 10^{-3} m in diameter, if the period of torsional oscillation of it with a metallic disc is 4sec. ($I=0.005\text{kgm}^2$).
3. Distinguish between concurrent and parallel forces.
4. Define centre of pressure.
5. State Fick's law.
6. State Graham's law of diffusion.
7. State the principle of virtual work.
8. Explain D'Alembert's principle.
9. Define a frame of reference.
10. An electron is moving with a speed of $0.85c$ in a direction opposite to that of a moving photon. Calculate the relative velocity of the photon.

PART – B

Answer any FOUR questions:

(4x7.5=30 Marks)

11. a) Define centre of oscillation and centre of suspension of a compound pendulum.
b) Show that the two are interchangeable. (3+4.5)
12. Derive an expression for the centre of pressure of a rectangular lamina.
13. a) Explain Torricelli's theorem.
b) Obtain an expression for the velocity of efflux of a liquid. (2.5+5)
14. a) What is meant by configuration of space?
b) How is this concept used to describe the motion of a system of particles? (2.5+5)
15. a) What is Newtonian relativity?
b) Show that acceleration is invariant under Galilean transformation. (2.5+5)

(P.T.O.)

PART – C

Answer any FOUR questions:

(4x12.5=50 Marks)

16. Obtain an expression for the period of oscillation of a Biflar pendulum with parallel threads.
17. Find out the positions of the centre of pressure of a triangular lamina immersed in a liquid with its (i) vertex and (ii) base, touching the surface of the liquid. (6+6.5)
18. a) State and prove Bernoulli's theorem.
b) Water flows along a horizontal tube of which the cross-section is not a constant. Calculate the change in pressure when the velocity of flow changes from 0.1 m/s to 0.2 m/s. (2+8+2.5)
19. a) State and prove the laws of conservation of linear momentum, angular momentum and energy for a system of interacting particles. (3x3)
b) By applying Lagrange's equations of motion, find out the acceleration of a simple pendulum. (3.5)
20. a) State and explain the basic postulates of Einstein's special theory of relativity. (3.5)
b) Discuss length contraction and time dilation with illustrations. (2x4.5)

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