LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

SECOND SEMESTER – APRIL 2010

PH 2500 - MECHANICS & SOUND

Date & Time: 20/04/2010 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

PART A (10x 2 m = 20 m)

1) Draw the velocity-time graph of a particle dropped from a certain height 'h', taking the downward direction as positive.
2) State the theorem of parallel axes of moment of inertia.
3) State the conditions of equilibrium for concurrent forces acting on a body.
4) Define the term 'meta centre'.
5) What are holonomic constraints of a system?
6) Define phase space.
7) Write down expression for the velocity of simple harmonic motion.
8) How do pressure and temperature affect the speed of sound wave in air medium?
9) What is Piezo-electric effect?
10) List any two applications of ultrasonic sound wave.

PART B (4 x 7 ½ m= 30 m)

Answer any FOUR questions

11) Derive expressions for time of flight, maximum height attained and the horizontal range of a particle projected with velocity u at an angle of elevation θ. (2 m+ 2 m + 2 ½ m)
12) Determine the centre of gravities (a) of solid cone and
(b) of solid hemisphere. (4m + 3 ½ m)
13) Derive the Hamilton's canonical equations of motion.
14) Two simple harmonic motions of equal amplitude and perpendicular to each other superimpose. Find the resultant motion (a) with a phase difference $\varphi = 0$ and (b) with a phase difference $\varphi = \pi/2$. (4 ½ m+ 1 m+ 2 m)
15) State and explain any four conditions for good acoustic design of a room.

PART C (4 x 12 ½ m = 50 m)

Answer any FOUR questions

16) (a) Obtain an expression for the moment of inertia of a solid sphere about any diameter.
(b) Derive an expression for the acceleration of body rolling down an inclined plane without slipping (6 ½ m+ 6 m)
17) (a) Derive Bernoulli's equation of fluid dynamics.
(b) Obtain an expression for the velocity of efflux. (6 ½ m+ 6 m)
18) Apply Lagrange's equation to (a) simple pendulum and (b) Atwood machine to obtain the equations of motion. (5 m + 7 ½ m)
19) What are beats? Obtain expression for beat frequency. Explain how you would demonstrate the phenomenon of beats in laboratory. (2 m+ 6 ½ m+ 4 m)
20) State and explain Sabine's law. Obtain an expression for the reverberation time.
(2 m+ 6 ½ m+ 4 m)

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