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MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

First Semester B.Sc. Degree Examination, November 2014
First Degree Programme under CBCSS
Core Course: Physics – I
AUPY141: Basic Mechanics and Properties of Matter

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. Girders are of the shape I. Why ?
2. Write down the formula for moment of inertia of a hollow cylinder of mass 'M', length 'L' and radius 'R' about an axis passing through the centre and perpendicular to its length.
3. Distinguish between transverse wave and longitudinal wave.
4. What are the minimum and maximum values of poisson's ratio ?
5. If ice on the polar caps of earth melts, how will it affect the duration of the day ?
6. Write down the differential equation of SHM.
7. State perpendicular axes theorem.
8. Write down the Poiseuille's formula and explain the symbols.
9. What is meant by neutral axis ?
10. What is meant by capillary rise ?

(10 x 1 = 10 Marks)

P.T.O.

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. State and proof parallel axes theorem.
12. Derive an expression for kinetic energy of a rotating body.
13. Find the velocity of a particle executing SHM.
14. Show that total energy of a particle executing SHM is constant.
15. Find moment of inertia of a rod about an axis passing through one end and perpendicular to its length.
16. Define Simple Harmonic Motion. What are the types of energy of harmonic oscillator.
17. Write short note on Torsion Pendulum.
18. Find an expression for strain energy in twisting a wire.
19. Most of the small liquid drops are spherical in shape. Why ?
20. Give definitions for young's modulus and rigidity modulus.
21. A steel rod and a wooden rod are joined end to end. About which axis passing through the rod will it have maximum moment of inertia ? Give reason.
22. What is meant by reverberation and time of reverberation ? Write and explain Sabine's formula.

(8 x 2 = 16 Marks)

SECTION – C

*Short essay type / Problems : Answer any **SIX** questions.*

23. A meter scale weighing 120 gm, makes 90 rpm about an axis through the centre and perpendicular to its length. Calculate kinetic energy of rotation about the axis.
24. A steel wire of radius 1 mm is bent to form a circle of radius 10 cm. What is the bending moment ? $Y = 2 \times 10^{11}\ Nm^{-2}$.
25. A particle executes SHM of period 22 seconds and amplitude 10 cm. Find the distance it travels in 3.5 seconds starting from the point of zero displacement.

26. The frequency of transverse vibration of a stretched string is 420 Hz. The frequency of next mode of vibration is 490 Hz. The tension of string is 4.5 N and its mass per unit length is 5×10^{-3} kg.m^{-1}. What is the length of the string ?
27. A particle executes SHM has speeds 3 cms^{-1} and 4 cms^{-1} at distances 8 cm and 6 cm respectively from the mean position. Find (i) period and (ii) amplitude, of oscillation.
28. A solid sphere of mass 20 kg and diameter 20 cm rotates about a central axis at 180 rpm. Find (i) angular momentum and (ii) K.E. of rotation.
29. Find the value of capillary rise when a capillary tube of radius 1 mm dipped in water (Density =1000 kg.m^{-3} and Surface Tension = 0.07 Nm^{-1}).
30. A cantilever of length 50 cm is depressed by 15 mm at the loaded end. Calculate the depression at a distance of 30 cm from the fixed end.
31. A rod of 0.8 m in length and 2 cm in diameter is clamped at one end. A torque is applied at the other end so that the rod get twisted through 45°. Find the torque applied. Rigidity modulus of the rod $= 7 \times 10^{10}$ Nm^{-2}.

(6 x 4 = 24 Marks)

SECTION – D

*Long essay type : Answer any **TWO** questions.*

32. Derive an expression for velocity of longitudinal wave in a gas.
33. Derive an expression for moment of inertia of solid sphere about any (i) diameter and (ii) tangent.
34. Briefly explain the necessary theory and the experimental method to find surface tension of a liquid by the capillary rise method.
35. Give the experimental set up and necessary theory to find rigidity modulus of material of rod by static torsion apparatus.

(2 x 15 = 30 Marks)

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