MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

First Semester B.Sc. Degree Examination, November 2015
First Degree Programme under CBCSS
Complementary Course: Physics – I (for Mathematics)
AUPY131.2c: Mechanics and Properties of Matter
(*for 2015 Admissions Only*)

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

SECTION – A

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

1. A pendulum clock is observed to give correct time at the equator. What happen when it is taken to the pole of the earth ?
2. What is a cantilever ?
3. Define radius of gyration.
4. State the law of conservation of angular momentum.
5. Define a progressive wave.
6. What is the effect of temperature on viscosity of liquids ?
7. Define wave front.
8. When does a particle executing simple harmonic motion experience i). maximum force and ii). minimum force ?
9. Two wires A and B of same material have lengths in the ration 1:2, diameters in the ratio 2:1. If stretched by the same the same force, what is the ration of their elongation ?
10. Why detergents are used for cleaning of clothes ?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. If ice on the polar caps melts, how will it affect the duration of the day ?
12. What are the conditions for the oscillatory motion to be simple harmonic ?
13. Why the mass of the fly wheel is concentrated at its rim ?
14. What do you mean by elastic after effect ?
15. Explain why the level of water rises while that of mercury is depressed in a capillary tube.
16. State and prove perpendicular axis theorem.
17. Why Poiseuille's formula fail in the case of tube with wide bore ?
18. Explain surface tension in terms of molecular theory.
19. What is flexural rigidity ?
20. Compare the loads require to produce equal depression for two beams of same material, length and weight, when one has a circular cross section and other has a square cross section ?
21. Show that moment of inertia of a disc about its diameter on its plane is half the MI of the same disc about an axis passing through the centre and perpendicular to its plane.
22. State superposition principle in wave motion.

(8 × 2 = 16 Marks)

SECTION – C

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

23. A steel wire of 1mm radius is bent to form a circle of 10 cm radius. What is the bending moment and maximum stress if $Y = 2 \times 10^{11}\ Nm^{-2}$?
24. An iron ball of radius 2 mm and density $7.8 \times 10^{3}\ kg.m^{-3}$ is passing through an oil column of density $0.9 \times 10^{3}\ kg.m^{-3}$ and coefficient of viscosity $0.8\ Nsm^{-2}$. Calculate the terminal velocity.
25. A body of mass 5 kg acquires an acceleration of $10\ rad/s^{-2}$ by an applied torque of 2 Nm. Calculate its moment of inertia and radius of gyration.

26. Show that couple required for a hollow cylinder to twist through same angle is greater than that required for a solid cylinder.
27. Two different spinning disks have same angular momentum. But disk 2 has a large moment of inertia than disk 1. Which one has the largest kinetic energy ?
28. A plate of metal 10^{-2} m^2 area rest on a layer of castor oil 2×10^{-8} m thick whose coefficient of viscosity is 1.55 Nsm^{-2}. Calculate the horizontal force required to move the plate with a uniform speed of 3×10^{-2} m/s.
29. The radius of a soap bubble blown in air is increased from 1 cm to 4 cm. How much energy will be needed if the surface tension of soap solution is 3.5×10^{-2} N/m.
30. A simple pendulum has a period 1second. After 100 complete oscillations, its amplitude is reduced to 1/10 of its initial value. Find the damping constant.
31. An HCl molecule vibrates with a fundamental frequency of 8.0×10^{13} Hz. What is the effective force constant (1 amu = 1.66×10^{27} kg) ?

(6 × 4 = 24 Marks)

SECTION – D

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

32. Derive the expression for moment of inertia a circular disc about i). an axis passing through its centre and perpendicular to the plane ii). a diameter and iii). a tangent.
33. What is a symmetric compound pendulum ? Describe an experiment to determine the value of acceleration due to gravity using the same.
34. Derive an expression for excess pressure on a curved liquid surface. Hence obtain the excess pressure inside a soap bubble.
35. Describe with theory an experiment to determine the young's modulus of a bar having rectangular cross section by uniform bending.

(2 × 15 = 30 Marks)

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