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MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

First Semester B.Sc. Degree Examination, November 2015

First Degree Programme under CBCSS

Core Course: Physics – I

AUPY141: Basic Mechanics & 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. On what factors does the radius gyration depend on ?
2. The type of elasticity that deals with the changes in shape is called _____.
3. What is the purpose of the pendulum of a clock or the balance wheel of a watch ?
4. What do you understand by the phrase "conservation of mechanical energy" ?
5. What is meant by 'equivalent simple pendulum' ?
6. Write any two examples of cantilever you observe in everyday life.
7. Define moment of inertia of a body in terms of the torque applied on it.
8. Explain which phenomenon in physics is used by musicians in matching the frequencies of different musical instruments.
9. Write down Sabine's reverberation formula and explain the terms.
10. What are reverberations ?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Why bridges are declared unsafe after a long use ?
12. Moment of inertia plays the same role in rotation as mass does in translation. Justify.

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13. How can a solid sphere be distinguished from a hollow sphere, the two being identical in all respects ?
14. Write any two differences between Mechanical and Electromagnetic Waves and also give an example.
15. Pole vaulting game relies on finding the most efficient way to transfer energy among different energy states. Elucidate the types of energy involved.
16. Reason out the statement "When you drop a pebble in water, you hear a sound wave, and you see ripples along the surface".
17. It is difficult to separate out two sticky glass plates glued together with water. Explain.
18. What are the factors that affect surface tension ?
19. Briefly explain the types of friction.
20. Why is that a transverse waves cannot propagate in a gas or a liquid ?
21. What are bow waves ? Define Mach number.
22. Which are the three kinds of elementary elastic waves present in a uniform isotropic medium ?

(8 × 2 = 16 Marks)

SECTION – C

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

23. A force of 12 N is applied to a metal wire of 2.5 mm diameter and 2m long. It stretches by 0.3 mm. Determine i). The stress in the wire and ii). Strain in the wire.
24. A flat thin uniform disc of radius 'a' has a hole of radius 'b' in it at a distance 'c' from the centre of the disc. If the disc were free to rotate about a smooth circular rod of radius 'b' passing through the hole, calculate the moment of inertia about the axis of rotation.
25. A flywheel of mass 500 kg and radius of gyration is 1 m makes 500 r.p.m. Calculate the energy of the flywheel.
26. If earth is considered as a sphere with radius 6.4×10^3 km of uniform density 5520 $kg.m^{-3}$, calculate its moment of inertia about its axis.

27. A man stand on the platform which vibrates simple harmonically in a vertical direction at a frequency of 5 Hz. At what displacement will the mass loses contact with the platform ?
28. A flexible wire of 80 cm length and a mass of 0.40 gm, is stretched across two stops which are 50 cm apart by a force of 500 N. Find the frequencies with which the wire may vibrate.
29. A sound of the rocket that explodes in air during fireworks spreads uniformly in all directions. The intensity of sound that reaches the listener standing at 640 m away from the explosion is 0.1 W/m^2. What is the sound intensity detected by the listener standing at 160 m away from the explosion ?
30. A small hollow sphere which has a small hole in it is immersed in water to a depth of 0.4 m before any water penetrates into it. If the surface tension of water is 0.073 N/m, find the radius of the hole.
31. Two separate air bubbles of radii 0.004 m and 0.002 m of the same liquid join together to form a double bubble, then find its radius.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Obtain the equation for couple per unit twist when a cylindrical rod is fixed at one end twisted at the other end. Describe the principle and experiment of the torsional pendulum method of determining the rigidity modulus of the material of the wire.
33. Derive the expression for the excess of pressure on a curved liquid surface. Hence obtain the expression for the excess of pressure inside a bubble.
34. Discuss the formation of standing waves in closed and open pipes.
35. What is meant by a driven oscillator ? Arrive at the differential equation for such an oscillator. Discuss the different cases of the driven oscillator.

(2 × 15 = 30 Marks)

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