



विद्या सर्वार्थ साधिका

ANANDALAYA
PERIODIC TEST – 3
Class : XI

Subject: Physics.

Date : 04-01-2023

MM :35

Time: 1 Hr. 30 min.

General Instructions:

1. There are 17 questions in this question paper. All questions are compulsory.
2. This question paper has four sections: Section A, Section B, Section C and Section D.
3. Section A - Q. No. 1 to 5 are objective type questions and carry 1 mark each.
4. Section B - Q. No. 6 to 9 are short answer questions and carry 2 mark each.
5. Section C - Q. No. 10 to 13 are long answer questions (I) and carry 3 marks each.
6. Section D - Q. No. 14 and 15 are long answer questions (II) and carry 5 marks.
7. There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and one question of five marks. You have to attempt only one of the choices in such questions.

SECTION A


1. If mass of earth is M , radius is R and gravitational constant is G , then work done to take mass m from earth surface to infinity will be _____.
(A) GMm/R (B) $GMm/2R$ (C) $-GMm/R$ (D) $-GMm/2R$
2. If the liquid neither rises nor falls in a capillary tube, then the angle of contact is _____.
(A) 0° (B) 45° (C) 90° (D) 180°
3. The velocities of three particles of masses 20g, 30 g and 50 g are $10\hat{i}$ m/s, $10\hat{j}$ m/s and $10\hat{k}$ m/s respectively. Find the velocity of the centre of mass of the three particles. (1)
4. Why is steel more elastic than rubber? Justify your answer. (1)
5. For the equilibrium of a body, two conditions need to be satisfied. State them. (1)

SECTION B

6. Prove: Kepler's second law of planetary motion. (2)
7. Define Poisson's ratio. Write minimum and maximum value of Poisson's ratio for a metal. (2)

(OR)

A wire suspended vertically from one of its ends is stretched by attaching a weight of 200 N to the lower end. The weight stretches the wire by 1 mm. Find the elastic energy stored in the wire.

8. The area of cross-section of the wider tube shown in figure is 0.08 m^2 . If a mass of 12 kg is placed on the massless piston, what is the difference 'h' in the level of water in the two tubes? (Take $g = 10 \text{ m/s}^2$) (2)

9. Find the torque about the origin due to a force $\vec{F} = (-3\hat{i} + \hat{j} + 5\hat{k}) \text{ N}$ acting on a mass whose position vector is $\vec{r} = (7\hat{i} + 3\hat{j} + \hat{k}) \text{ m}$. (2)

SECTION C

10. A spherical liquid drop has radius r . The surface tension of the liquid is T . Derive an expression for the excess pressure inside the drop? What will be the value of excess pressure if it is a bubble? (3)

11. A child stands at the centre of a turntable with his two arms outstretched. The turntable is set rotating with an angular speed of 40 rev/min. How much is the angular speed of the child if he folds his hands back and thereby reduces his moment of inertia to $\frac{2}{5}$ times the initial value? Assume that the turntable rotates without friction. (3)

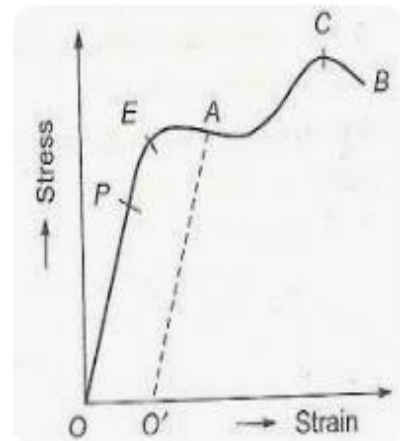
(OR)

A rope of negligible mass is wound round a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N? What is the linear acceleration of the rope? Assume that there is no slipping. Moment of inertia of a hollow cylinder is MR^2 .

12. Viscosity is the property of a fluid by virtue of which an internal force of friction comes into play when a fluid is in motion and which opposes the relative motion between its different layers. Viscous force F is directly proportional to (i) the area A of the layers and (ii) the velocity gradient between the layers. Answer the following questions based on viscosity of fluid. (3)

- Write the SI unit of coefficient of viscosity.
- The relative velocity of two consecutive layers is 8 cm/s. If the perpendicular distance between the layers is 0.1 cm. Find the velocity gradient between layers.
- How do the viscosity of liquids and gases change with increase in temperature?

13. The Stress-Strain graph of a metal wire is shown in figure. Up to the point E, the wire returns to its original state O along EPO when it is gradually unloaded. Point B corresponds to the fracture of wire. (3)



- Up to what point of the curve Hooke's Law is obeyed?
- Which point on the curve corresponds to yield point or elastic limit?
- Indicate the elastic region and plastic region.
- Describe what happens when the wire is loaded up to the stress corresponding to point A and then unloaded gradually. In particular, explain the dotted line.

SECTION D

14. (a) Define escape velocity. (5)
 (b) Obtain an expression for the escape speed of a body from the surface of the earth.
 (c) A tennis ball and a cricket ball are to be projected out of the gravitational field of the earth. Do we need different velocities to achieve so? Give reason for your answer.

(OR)

- Derive an expression for the acceleration due to gravity ' g ' at a depth ' d ' from the centre of the earth.
- What is the value of ' g ' at the centre of the earth?
- At what height above the earth's surface, is the value of ' g ' same as in a mine 80 km deep?

15. State Bernoulli's theorem. With the help of suitable diagram, establish Bernoulli's equation for liquid flow. (5)