

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI- 86

END SEMESTER EXAMINATION (ONLINE)- NOVEMBER 2021

PROPERTIES OF MATTER AND SOUND

CLASS: I B.SC. PHYSICS

TIME: 3 Hrs

SUBJECT CODE: 19PH/MC/PS14

MAX. MARKS: 100

SECTION-A

ANSWER ALL THE QUESTIONS

CHOOSE THE CORRECT ANSWER

(8x1=8)

1. The modulus of rigidity and Poisson's ratio of the wire are $2.87 \times 10^{10} \text{ N/m}^2$ and 0.379 respectively. What is the value of young's modulus of the material of the wire.
a) $1.08773 \times 10^{10} \text{ N/m}^2$
b) $7.915 \times 10^{10} \text{ N/m}^2$
c) $7.5725 \times 10^{10} \text{ N/m}^2$
d) $0.1403 \times 10^{10} \text{ N/m}^2$
2. The height of water in a capillary tube of radius 2 cm is 4 cm. What should be the radius of the capillary tube, if water should rise 8 cm in the tube?
a) 1 cm b) 0.1 cm c) 2 cm d) 4 cm
3. In case of water and glass, we get a concave meniscus because the adhesive force between water and glass are _____ than the cohesive forces between water molecules.
a) Weaker b) Stronger
c) Same d) All the above
4. For a constant force, a rope breaks due to stress. Which of the following is useful to reduce the stress?
a) Increase the length of the rope
b) Apply small force
c) Increase the cross sectional area of the rope
d) Use a different material of rope
5. For an individual atom or molecule, the Doppler shifted absorption frequency is given by
a) $\nu = \nu_0 \left(1 \pm \frac{v}{c} \right)$ b) $\nu = \frac{1}{2\pi\tau}$
c) $\nu = 2\nu_0 \left(1 \pm \frac{v}{c} \right)$ d) $\nu = \frac{1}{\nu_0} \left(1 \pm \frac{v}{c} \right)$

14. What do you mean by Elastic limit?
15. Explain the term 'neutral axis' in a bar.
16. Distinguish between cohesive and adhesive forces.
17. An air bubble of radius 0.1mm is situated just below the surface of water. Calculate the excess pressure inside the bubble. S.T. of water is 0.072 Nm^{-1} .
18. What is the effect of pressure on the viscosity of a liquid?
19. What are the factors affecting the acoustic quality of a building?
20. How stationary waves are produced?

SECTION B

ANSWER ANY FOUR QUESTIONS

(4x9=36)

21. A solid cylinder of 2 cm radius weighing 200 g is rigidly connected with its axis vertical to the lower end of the fine wire. The period of oscillation of the cylinder under the influence of the torsion of the wire is 2 sec. calculate the couple necessary to twist it through 4 complete turns.
22. Water is flowing in a capillary tube 40 cm long and of 1 mm internal radius under a constant pressure head of 15 cm of water. Calculate the maximum velocity of water in the tube and verify that the flow is streamlined. Given for water viscosity 0.0098 poise, Reynold's number = 100 and $g = 9.8 \text{ m/s}^2$.
23. Calculate the difference of pressure across an element of the curved surface of a liquid in terms of surface tension and the principal radii of curvature of the element.
24. (i) Two tuning forks A and B give 5 beats/second. The frequency of A = 612. When B is filled, 5 beats/second are again produced. Find the frequency of B before and after filling.
(ii) Calculate the velocity of sound in a gas in which two waves of length 50 cm and 50.4 cm produce 6 beats/second.
25. Explain the production of ultrasonic waves by piezoelectric method.

SECTION C

ANSWER ANY ONE QUESTION

(1x30=30)

26. A. What is a cantilever? Derive an expression for the depression at the free end of a cantilever due to load. (15)
B. what is reverberation time? Derive Sabine's formula for reverberation time. (15)
27. A. Explain Doppler effect. Find an expression for the change in frequency of a note when both the source of sound and the observer are in relative motion. (15)
B. Derive the Poiseuille's formula for the rate of flow of liquid through a capillary tube. (15)

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