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SUBJECT CODE NO: - Y-2013
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. F.Y (Sem. I)
Examination March / April - 2023
Physics Paper-I Mechanics Properties of Matter and Sound

[Time: 1:30 Hours]

[Max. Marks: 50]

Please check whether you have got the right question paper.

N. B

- 1) Attempt all questions.
- 2) Use of logarithm table and electronic pocket calculator is allowed.

Q1 a) Derive an expression for gravitational potential and gravitational field due to a spherical shell at a point outside the shell. 10

b) Explain Cantilever? Obtain an expression for cantilever loaded at free end when weight of beam is effective. 10

OR

c) Define viscosity of a liquid? Derive an expression for total energy liquid flow. 10

d) Derive an expression $E = E_m e^{-\alpha t}$ by using Sabine's formula. 10

Q2 a) Write a short note on Newton's Law of gravitation. 05

b) The radius of earth $6.37 \times 10^8 \text{ cm}$ its mean density 6gm/cc and the gravitational constant $G = 6.66 \times 10^{-8} \text{ dynes cm}^2/\text{gm}^2$. Calculate the earth's surface potential. 05

c) Write a short note on law of hydrostatics pressure. 05

d) Calculate the excess of pressure between the inside and outside of a soap bubble of radius 0.01m . Surface tension of soap solution is $3.5 \times 10^{-1} \text{ N/M}$ 05

OR

a) Write a short note on Modules of rigidity (η) 05

b) A brass bar 1cm square in Cross-section is supported on two Knife-edges 100cm apart. A load of 2kg at the centre of the bar depression that point by 0.25cm . What are Young's modules of a brass? 05

c) Explain briefly application of Ultrasonic waves. 05

d) Calculate velocity of longitudinal wave in magnetostriction rod of length 0.4m . At resonance the value of inductance is 2H and that of capacitor is $0.02 \times 10^{-6} \text{ F}$ 05

Q3 Multiple choice questions.

10

- 1) The unit of gravitational potential is.
 - a) J
 - b) J/kg
 - c) J.kg
 - d) Kg

- 2) The gravitational field potential at a distance r from a solid sphere is x . The solid sphere is now replaced by an identical hollow sphere of the same mass. The gravitational field potential now changes from x to y . the ratio x/y is,
 - a) Infinite
 - b) 0
 - c) 1
 - d) -1

- 3) The gravitational potential at a point on the outer surface of the spherical shell of mass M and radius R is,
 - a) $\frac{Gm}{R^2}$
 - b) $\frac{-Gm}{R^2}$
 - c) $\frac{Gm}{R}$
 - d) $\frac{-Gm}{R}$

- 4) The bulk modulus of a gas is $6 \times 10^3 \text{ N/m}^2$ the additional pressure needed to reduce volume of the gas by 10% is
 - a) 300 N/m^2
 - b) 400 N/m^2
 - c) 1000 N/m^2
 - d) 600 N/m^2

- 5) According to Hooke's law of elasticity, within elastic limits, if the stress is increased, the ratio of stress to strain.
 - a) Increases
 - b) Decreases
 - c) Becomes zero
 - d) Remains constant

- 6) The symbol Y, K and η represent the Young's modulus, bulk modulus and rigidity modulus of the material of a body. If $\eta = 3K$, then
 - a) $Y = 2.5K$
 - b) $Y = 3.5K$
 - c) $Y = 4.5K$
 - d) $Y = 9K/5$

- 7) Filter pump is used to generate
- Elasticity
 - Force
 - Vacuum
 - Pressure
- 8) Viscosity of liquid is given by formula
- $\frac{\pi r^4}{8 l J}$
 - $\frac{P \pi r^4}{8 l J}$
 - $\frac{P \pi r}{4 l J}$
 - $\frac{4 P \pi}{l J r^4}$
- 9) Technique used for detection of flaw in railway track
- X-rays
 - R-rays
 - Ultrasonic
 - Ultraviolet
- 10) Reverberation in hall is due to
- Refraction of sound
 - Reflection of sound
 - Refraction of light
 - Reflection of light