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**SUBJECT CODE NO:- 2013**
**FACULTY OF SCIENCE & TECHNOLOGY**
**B.Sc. F.Y Sem-I**
**Examination March/April-2022 (To be held in June/July-2022)**
**Physics Paper-I**
**Mechanics Properties of Matter and Sound**

**[Time: 1:53 Hours]** **[Max. Marks:50]**

Please check whether you have got the right question paper.

N.B
i. Attempt all questions.
ii. Use of logarithm table and electronic pocket calculator is allowed.

Q.1 a) Derive an expression for gravitational potential at a point inside a uniform solid sphere. 10

b) Define cantilever? Obtain an expression for cantilever loaded at free and when weight of beam is ineffective 10

OR

c) Determine surface tension of a liquid by Jaeger's method. 10

d) Derive an expression for reverberation time and explain conditions for good acoustic design of hall. 10

Q.2 a) Write a short note on Newton's law of gravitation. 5

b) Calculate the mass of the earth from the following data 5
g = 980 cm/s$^2$, G=$6.6 \times 10^{-8}\ cm^3 gm^1 \sec^2$ $R = 6.38 \times 10^8 cm$

c) Define viscosity, ideal liquid, stream line flow, Bernoulli's theorem 5

d) A capillary tube $10^{-3}$ m in diameter and 0.2 m in length is fitted horizontally to a vessel kept full of liquid of density$0.8 \times 10^3 kg/m^3$. The depth of the centre of capillary tube below the surface of liquid in 0.3 m. viscosity of liquid is 0.0014 N-s/m$^2$. Calculate the volume of liquid that flow in 5 minute. 5

OR

a) Write a short note on Bulk modulus. 5

b) Calculate the twisting couple on a solid shaft of length 1.5m and diameter 120mm. when it is twisted through an angle $0.6^0$. the coefficient of rigidity for the material of the shaft may be taken to be $93 \times 10^9 N/m^2$ 5

c) Define ultrasonic waves and give its features 5

d) A quartz crystal is vibrating at resonance. The length of crystal is 0.06m. Y for quartz is 5

$7.9 \times 10^{10} N/m^2$ and $\varrho$ for quartz is 2650 kg/m$^3$. Calculate fundamental frequency for it.

Q.3 Multiple choice questions 10

1) The gravitational potential at a point on the surface of earth is
   a) g
   b) gR
   c) gR/2
   d) Zero

2) $[L^2T^{-3}]$ is the dimensional formula of
   a) Gravitational potential strength
   b) Gravitational potential energy
   c) Gravitational potential
   d) Gravitational potential gradient

3) If the work done in stretching a wire by 1 mm is 2J, the work necessary for starching another wire of the same material but with double the radius of cross-section and half the length by 1 mm is in joules
   a) 16
   b) 8
   c) 4
   d) 1/4

4) Shearing strain is given by
   a) Deforming force
   b) Shape of shear
   c) Angle of shear
   d) Change in volume of the body

5) Potential energy per unit volume of the liquid is
   a) $\rho gh$
   b) $gh/\rho$
   c) $g\ \rho/h$
   d) $h/\rho g$

6) Total energy for unit mass of liquid flow = constant. This theorem is
   a) Gauss-divergence theorem
   b) Stok's theorem
   c) Bernoulli's theorem
   d) Surface tension

7) The force per unit length acting normally along a line tangent to its free surface of liquid is called
   a ) Ultrasonic  b) Pressure  c) Surface tension  d) Viscosity

8) Ultrasonic waves are
   a) Parallel waves
   b) Perpendicular waves
   c) Transverse waves
   d) Longitudinal waves

9) For good acoustical design of hall, reverberation should be
   a) Zero
   b) Proper
   c) Maximum
   d) Infinite

10) For very high frequency ultrasonic generation following method is used
   a) Magnetostriction method
   b) Bernoulli's method
   c) Jager's method
   d) Piezoelectric method