B.Sc. Sem-I

1S-PHY 102 - Physics Paper-II
(Waves, Properties of Matter and Kinetic Theory)

P. Pages : 2 **GUG/S/19/1219**

Time : Three Hours * 0 9 1 7 * Max. Marks : 50

Notes : 1. All questions are compulsory.
2. Draw neat diagram wherever necessary.

1. Either

a) i) Explain the characteristics of transverse waves. **2**

ii) Derive an expression of longitudinal waves in liquid medium. **6**

iii) The velocity of sound in air at 27º C and at normal pressure is 345 m/sec. Find the velocity at temperature 127º C and the pressure double that of normal pressure. **2**

OR

b) i) Define three Elastic constant. **3**

ii) Obtain an expression for the depression of beam when it is loaded in the middle and supported at the two ends. **5**

iii) A rectangular bar of length 1m and square crosssection of side 5×10^{-3} m is supported horizontally on two knife edges when it is loaded in the middle by a mass of 0.1 Kg depression produces there is 1.96×10^{-3} m. Calculate Yong's modulus of the material of the beam. **2**

2. Either

a) i) Distinguish between streamline flow and turbulent flow. **3**

ii) State and prove Bernoulli's theorem. **5**

iii) Explain the application of Bernoulli's theorem to lift of an Aeroplane. **2**

OR

b) i) Give any four Postulates of Kinetic theory of gases. **3**

ii) State and prove law of equipartition of energy. **4**

iii) The average Kinetic energy of hydrogen gas at 0º C is formed to be 5.64×10^{-21} J / k Calculate the Avagadros number consider the universal gas constant R = 8.32 J/k. **3**

3. Either

a) What are ultrasonic waves? Mention it's properties. **2½**

b) Derive the relation between three elastic constant y, k and n. **2½**

c) In a horizontal pipeline of uniform area of Cross - section the pressure falls by 10 N/m^2 between two points separated by a distance of 2 Km. What is the change in Kinetic energy per Kg of the flowing at these points? Density of oil = 800 Kg/m^3. **2½**

d) Show that mean free path of molecules of gas is given by $\lambda = \frac{1}{\sqrt{2}\pi\sigma^2 n}$ **2½**

OR

e) Derive the relation between phase velocity and group velocity. **2½**

f) Obtain an expression for time period of torsional pendulum. **2½**

g) Explain the formation of rain drop. **2½**

h) The Vander wall's constant a and b for gm molecule of hydrogen are a = 0.245 atm litre $mole^{-2}$ and $b = 2.67 \times 10^{-2}$ litre $mole^{-2}$. Calculate critical temperature. **2½**

4. Either

a) What is SONAR? How it is useful to measure the depth of the sea. **2½**

b) Show that value of Poisson's ratio lies between -1 to 0.5. **2½**

c) Explain Laplace molecular theory of surface tension. **2½**

d) Explain degrees of freedom. **2½**

OR

e) Mention medical applications of ultrasonic waves. **2½**

f) Explain Elastic limit and Yield point. **2½**

g) Derive an expression for the excess pressure inside spherical bubble of air in a liquid. **2½**

h) Explain the corrections introduced by Vander wall's in the gas equation. **2½**

5. Attempt **any ten** of the followings.

a) What is overtone? **1**
b) State the principle of superposition of wave. **1**
c) Mention the applications of infrasonic waves. **1**
d) State Hook's law. **1**
e) Define Poisson's ratio. **1**
f) Define Torsional pendulum. **1**
g) Define velocity gradient. **1**
h) Define coefficient of viscosity. **1**
i) What is surface tension? **1**
j) Define mean free path of molecule of gas. **1**
k) What is transport phenomenon? **1**
l) What is Boyle's law? **1**

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