Date - 23/3/15 FYBSC Sem I

Physics - I

VCD 230315 F.Y.B.Sc.(Sem I) 2014-15 PHYSICS-I MARKS-75 TIME : 2:30hrs

NOTE: Numbers in the right indicate marks.

All questions are compulsory.

Use of non-programmable calculators is allowed.

Q.1) Answer the following: **(20 marks)**

A) What do you mean by Hooks law, Elastic limit and Yield point? Draw the curves showing Relationship between stress and strain, extension and load to illustrate the points. (8M)

OR

A) Derive Poisseulle's law for a liquid flowing in a narrow tube. State the assumption mode? (8M)

B) Prove that in the pipe of varying area of cross-section the liquid will flow slowly where the cross-sectional area and move faster where the cross-section area is small. Derive the relation connecting the two quantities. (7M)

OR

B) Show that for homogenous isotropic material $Y=2\eta(1+\sigma)$. (7M)

C) A cricket ball of mass 375g is moving with a velocity of 17 m/s and is hit by a bat so that the ball is turned back with a velocity of 29 m/s. the force of the blow of blow acts for 0.055 s. Find the average force exerted on the ball by the bat. (5M)

OR

C) Describe Newton's second law of motion with suitable example. (5M)

Q.2) Answer the following: **(20 marks)**

A) Obtain the relation between P,V and T in an adiabatic interaction for a perfect gas.(8M)

OR

A) Prove that for real gas $C_p-C_v=[(\frac{\partial U}{\partial v})_T+P](\frac{\partial V}{\partial T})_p$ .Show that it reduces to $C_P-C_V=R$ for perfect gas, Hence prove that $(\frac{\partial U}{\partial V})_T=\frac{CP-CV}{\beta V}-p$ (8M)

B) State and explain zeroth law of thermodynamics with certain quantity of perfect gas at NTP in compressed adiabatically to one fourth of its original volume, calculate the resulting pressure and temperature($v = 1.4$) (7M)

OR

B) Define enthalpy and hence shows that first law of thermodynamic can be written as $dQ = C_p dT+[(\frac{\partial H}{\partial P})_T-V]\,dp$. (7M)

C) Calculate the temperature drop over 1km of the atmosphere if $v = 1.4$ for air and the average molecular weight of the air is 0.029 kg/mol $R=8.4$ $Jmol^{-1}K^{-1}$ and $g=9.8$ m/s^2 (5M)

OR

C) State the term work done in thermodynamic one mole of perfect gas occupying 6 litres at 1 atm pressure is adiabatically compressed to 2 litre $C_V=\frac{3}{2}R$ Calculate the work done on the gas 1 atm=10^5 N/m^2. (5M)

P.T.O.

Q.3) Answer the following: **(20 marks)**

A) Derive an expression for the velocity of a simple harmonic wave in a stretched string (8M)

OR

A) What are Ultrasonics? Describe methods for their production. (8M)

B) Explain Quartz crystal. Draw a neat sketch of naturally found Quartz crystal, its cross-section showing the optical axis, electrical axis and mechanical axis. (7M)

OR

B) State the wave equation for one dimensional motion and obtain its solution. (7M)

C) Explain X-cut and Y-cut crystal. (5M)

OR

C) For a metallic rod of density 7.5 gm/cm^2 and Young's modulus 7.5×10^{11} dyne/cm^2, the fundamental produced has a frequency of 300 Hz. Find the wavelength of fundamental. (5M)

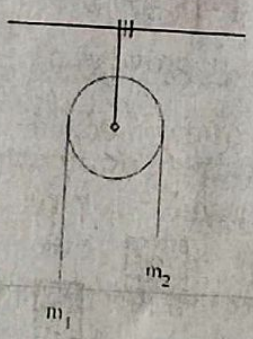
Q.4) Answer the following (Any 3): **(15 marks)**

A) Explain the term isobaric, isochoric, isothermal and adiabatic interaction.

B) Discuss path dependence of heat energy.

C) During blood transfusion, the bottle is set up to that the level of blood in it is 1.35m above the needle, which has internal diameter of 0.40 mm and 405 cm in length. In one minute 408cc of blood passes through the needle. Calculate the viscosity of blood if its density is 1020 kg/m^3.

D) Two unequal masses m_1 and m_2 connected by light and an inextensible string of negligible mass are hung vertically over light weight and frictionless pulley (Atwood Machine). If $m_1 > m_2$ determine the acceleration of two masses and tension in the string.



E) Describe briefly applications of ultrasonic waves in Medical applications and Formation of alloys.

F) Describe briefly sonar and depth sounding.