120

021222

VCD F.Y.B.Sc. Physics I Total Marks-75 Time-2:30 Hrs

Note: i) All the questions are compulsory.
ii) figures to the right indicate full marks.
iii) Draw neat labeled diagrams whenever necessary.

Q.1 A] Attempt *any one* of the following: [10]

i)State and prove work energy theorem.

ii) A body of mass m is suspended by two strings making angles α and β with the horizontal. Find the expression for tensions in the strings. If m=100N, α =40° β = 50°. Find magnitudes of tensions T1 and T2 in the two strings.

Q.1 B] Attempt *any two* of the following: {5 Marks each} [10]

i) A cricket ball of mass 350g is moving with a velocity of 14m/s and is hit by a bat so that the ball is turned back with a velocity of 24m/s. The force of the blow acts for 0.035s. Find the average force exerted on the ball by the bat.

ii) The force on point mass of 50g is F=15i +10j. If it starts from rest. Find its position at a time t=5s

iii) Explain the work done by constant force when the work done is positive,negative and zero.

iv) Write advantages and disadvantages of friction.

Q.2A] Attempt *any one* of the following: [10]

i) Show that for homogeneous isotropic material $Y = 2\eta(1+\sigma)$.

ii) For liquid flowing through pipe of variable cross-section, Show that the velocity of a flow at a section varies inversely as the area of cross section of section.

Q.2 B] Attempt *any two* of the following: {5 Marks each} [10]

i) For a steel material, $Y=2\times10^{11}$ N/m^2 and bulk modulus is 1.33×10^{10} N/m^2.calculate Poisson's ratio and modulus of rigidity of steel.

ii)With the help of a diagram explain how will you measure the speed of Efflux.

iii)A wire has Young's modulus 1.2×10^{11}N/m^2 is subjected to a stress of 2.4×10^{7} N/m^2.If the length of wire is 10m.Obtain the extension produced in it.

iv) Define Poisson's ratio .Show that the theoretical limiting values of poisson's ratio are 1 and 0.5.

Q.3 A] Attempt *any one* of the following: [10]

i) Derive the expression for the work done by the system in the Adiabatic process.

ii))State the ideal gas equation. Discuss the Van der waals correction to the pressure and volume in terms of this equation.

Q.3 B] Attempt *any two* of the following: {5 Marks each} **[10]**

i) One mole of a perfect gas at 127°c undergoes isothermal expansion till the volume is doubled Calculate the work done by gas and heat absorbed.Given: R=8.3J/mol°K

ii) State and prove Zeroth law of the thermodynamics.

iii) 2 moles of gas expands isothermally and reversibly from 20L to 30L at 300K.Find the work done.R=8.314J.mol

iv)One mole of gas obeying Van der Waals equation at 0°C occupies 550cm^3 of volume. Calculate the pressure exerted by it.a=0.37Nm^{4}mol^{-2},b=43x10^{-6}m^{3}mol-1 R=8.31JK^{-1}mol^{-1}

Q.4 Attempt *any 3* of the following {5 Marks each} **[15]**

i) Explain the concept of free body diagram with illustration

ii) A mass is suspended from rigid support by and in extensible string OA of negligible mass. The mass is pulled aside by a similar horizontal string AB until OA and Θ with the vertical . Show that tension in the string AB and OA are given respectively T1 = mg tanΘ and T2 =mg secΘ.

iii) Define stress and strain write the SI unit and dimension of it

iv) A metal wire of length L and radius R is stretched assuming that the volume of the wire is unchanged show that poisson's ratio of material is ½.

v) calculate diameter of the molecules of a gas for which the Van der waals constant b is 115x10^{-4} when referred to one cc of gas at NTP.

vi) Explain the work is a path dependence.

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