VCD 11/12/23 F.Y.B.Sc. Sem I Physics I Time: 2hr 30 min Marks: 75

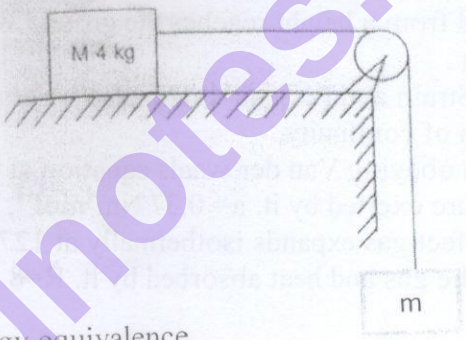
Note- *All the questions are compulsory.
***Non programmable calculator is allowed.**
***Number indicates on right indicate full marks.**

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

i)Derive an expression for work -energy theorem.
ii)State and explain Newton's laws of motion

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

i)State laws of friction.
ii) Explain Non-Inertial frame of reference.
iii) The coefficient of static friction between the blocks of mass 4kg and the table (shown in figure) is μ_s =0.4. What should be the maximum value of 'm' so that the blocks do not move? The string and the pulley are light and smooth.



iv)Write a short note on mass energy equivalence.

Q.2A]tempt *any one* of the following: [10]
i) Derive a relation between the young's modulus, bulk modulus and poisson's ratio of the substance.
ii) State and prove Bernoulli's theorem.

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

i) Define Poisson's ratio. Show that the theoretical limiting values of Poisson's ratio are -1 and 0.5.
ii) State and explain Stoke's law. What are its applications?
iii) A venturimeter consists of a pipe of diameter 36cm and a throat diameter of 20cm. Estimate the rate of flow of water in m^3/sec; if the water pressure in the pipe is 60000 pa and in the throat is 40000 pa [Given : density of water = 1000 Kg/m^3].
iv) For a steel material, Y = 2 X 10^{11} N/m^2 and bulk modulus is 13.3 X 10^{10} N/m^2, calculate Poisson's ratio and modulus of rigidity of steel.

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

i)Prove that foe a real gases $C_p-C_v=[(\frac{\partial U}{\partial V})_T+p](\frac{\partial V}{\partial T})p$

ii) Explain the concept of work. Derive the expression for work done in Adiabatic process.

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

i) A perfect gas system at 2 atm pressure and 27°C temperature is adiabatically compressed to 1 atm pressure. Calculate the resulting temperature. (r=1.4)

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

iii) Distinguish between ideal and real gases.

iv) State and explain the Zero'th laws of thermodynamics

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

i) Give advantage and disadvantage of friction.

ii) A ball a dropped from a height reaches the ground with speed of $\sqrt{gh}$ .Calculate the work done by air friction .

iii) Define Stress, Strain and Poisson's ratio also write their units and dimensions.

iv) Derive equation of continuity.

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

vi) 1moles of a perfect gas expands isothermally at 127°C till its volume is doubled. Calculate the work done by the gas and heat absorbed by it. R=8.3 J/moleK.

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