F.Y.B.SC. SEM – II (CBCS - 2016 COURSE) : SUMMER - 2018
SUBJECT : PHYSICS: KINETIC THEORY AND THERMODYNAMICS

Day : **Monday** Time : **03.00 PM TO 06.00 PM**
Date : **16/04/2018** **S-2018-0634** Max. Marks : 60.

N.B.:

1) All questions are **COMPULSORY.**
2) Figures to the **RIGHT** indicate full marks.
3) Draw neat labeled diagrams **WHEREVER** necessary.
4) Use of electronic calculator/ log table is **ALLOWED**

Q.1 A) Attempt all the followings: **(06)**

a) The Boyle's temperature for reduced equation of state is inversely proportional to
1. a 2. b/a 3. R 4. a/b

b) The average kinetic energy per mole is directly proportional to
1. Pressure P 2. R 3. Temperature T 4. Volume V

c) A pendulum oscillating in air is an example of ____ process
1. Reversible 2. Adiabatic 3. Irreversible 4. Isochoric

d) Two valves or inlets are present in the
1. Carnot engine 2. Diesel engine 3. Petrol engine 4. All of them

e) The internal energy decrease in an _____ process
1. Isochoric 2. Isobaric 3. Isothermal 4. Adiabatic

f) The change of pressure with temperature for a liquid getting converted to gas is
1. Negative 2. Positive 3. Cyclic 4. Constant

B) Attempt all of the followings: **(06)**

a) What is meant by irreversible process? Give examples.
b) Give the efficiency of Carnot's engine.
c) State the two types of heat engines on the basis of combustion.
d) Give the expression for efficiency of diesel engine.
e) Define the terms: (i) Closed system (ii) Isolated system.
f) State the law of corresponding states.

Q.2 Attempt any **THREE** the followings: **(12)**

a) Write short note on Refrigerator.
b) A metal of mass 1 kg at constant atmospheric pressure and at initial temperature 20°C is given a heat of 20000 J so as to its temperature rises to 70°C. Find the work done and change in internal energy.
(Given:Change in volume = $5 \times 10^{-7} m^3$ and atmospheric pressure = $10^5 Nm^{-2}$).
c) Calculate the pressure exerted by one mole of water vapour in a $0.001 m^3$ container at 423 °K assuming it obeys Van der Waal's equation.
(Given: a = 0364 $Nm^4 mole^{-2}$; b = 3.05×10^{-5} $m^3 mole^{-1}$).
d) State and prove Carnot's theorem.

P.T.O.

Q.3 Attempt any **FOUR** the followings: **(12)**

a) Derive the relation between Boyle's temperature and critical temperature of gas.

b) Prove that the slope of an adiabatic curve is γ - times the slope of an isothermal curve in PV diagram.

c) Explain Otto cycle with indicator diagram.

d) What is thermodynamic equilibrium? What are its basic requirements?

e) A Carnot's engine whose low temperature is at $10^{o}C$ and has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees should the temperature of the higher reservoir be raised?

Q.4 Attempt any **TWO** the followings: **(12)**

a) Describe the four states of one complete cycle of diesel engine.

b) Derive Van der Waal's equation of state for real gases.

c) Derive an expression for work done during adiabatic process.

Q.5 Attempt any **TWO** the followings: **(12)**

a) Explain construction and working of Diesel engine.

b) Show that entropy remains constant during reversible cyclic change.

c) State drawbacks of Van der Waal's equation and deduce reduced equation of state from Van der Waal's equation.

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