TDC Odd Semester Exam., 2020
held in July, 2021

PHYSICS

(Pass)

(3rd Semester)

Course No. : PHSP–301

(Heat and Thermodynamics)

Full Marks : 35
Pass Marks : 12

Time : 2 hours

The figures in the margin indicate full marks
for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Describe the construction and working principle of a thermocouple thermometer. 2+3=5

   (b) What is the principle of a platinum resistance thermometer? 2

(2)

2. *(a)* Why are there two specific heats of gases? Also explain which one is greater and why. 2+2=4

   (b) Show that for an ideal gas, C_p C_v R, where the symbols have their usual meanings. 3

UNIT—II

3. *(a)* Describe Andrew's experiments on carbon dioxide. Discuss the results obtained by him. 3+2=5

   (b) Define critical constants. 2

4. *(a)* Write down the Maxwell's distribution law of velocity. Show that the root-mean-square speed $\sqrt{\dfrac{3kT}{m}}$, where the symbols have their usual meanings. 1+2=3

   (b) State the law of equipartition of energy. 1

   (c) Calculate the work done during an adiabatic expansion of a gas. 3

UNIT—III

5. *(a)* What are the different methods by which transfer of heat takes place? 2

(3)

(b) Define thermal conductivity. Define coefficient of thermal conductivity. Mention its units and dimensions.
1+1+1=3

(c) What is rectilinear flow of heat? 2

6. *(a)* Describe Ingen-Hausz experiment to compare the thermal conductivities of different materials. 5

(b) In an Ingen-Hausz experiment, wax melted over 10 cm of copper rod and over 4 cm of iron rod. What is the conductivity of iron when the conductivity of copper is 0·90? 2

UNIT—IV

7. *(a)* Calculate the work done in Carnot's cycle of operation. 5

(b) Deduce the efficiency of a Carnot's engine in terms of the temperatures between which it works. 2

8. *(a)* Using the first law of thermodynamics, deduce the relation PV = constant, where the symbols have their usual meanings. 4

(4)

(b) Explain reversible and irreversible processes with examples. 2

(c) Mention one physical significance of entropy. 1

UNIT—V

9. *(a)* State and deduce Kirchhoff's law of radiation. 2+3=5

(b) Define emissive power and absorptive power for a substance in connection with thermal radiation. 2

10. *(a)* Write down and explain the terms of Planck's formula for black-body radiation. Discuss the revolutionary idea introduced by Planck while deducing the Planck's formula. 2+1=3

(b) Show how Wien's energy distribution law and Rayleigh-Jeans law can be obtained from Planck's law. 3

(c) "Good emitters are good absorbers as well." Explain. 1

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