Reg. No. : ....

Name : ....

V Semester B.Sc. Degree CBCSS (OBE) Regular Examination, November 2021
(2019 Admn. Only)
CORE COURSE IN PHYSICS
5B08PHY – Thermodynamics and Statistical Mechanics

Time : 3 Hours

Max. Marks : 40

PART – A

Short answer questions. Answer **all** questions. **Each** carries **one** mark.

1. State Zeroth law of thermodynamics.

2. What do you mean by quasistatic process ?

3. State Kirchoff's law of radiation.

4. On what all factors internal energy of a real gas depends ?

5. Write Claussius statement of second law of thermodynamics.

6. What is a cyclic process ? What is the change in internal energy in a cyclic process ?

(6×1=6)

PART – B

Short Essay questions. Answer **any six** questions. **Each** carries **two** Marks :

7. Distinguish between microscopic point of view and macroscopic point of view.

8. What are state functions and path functions ? Give one example for each.

9. Obtain the pressure-volume relation for quasistatic adiabatic process of an ideal gas.

10. Briefly explain different strokes in a Gasoline engine.

11. Explain Carnot cycle.

12. Explain the principle of increase of entropy.

13. Write four Maxwell's equations connecting thermodynamic coordinates.

14. What are bosons and fermions ? Give examples for each.   (6x2=12)

PART – C

Problems. Answer **any four** questions. **Each** carries **three** Marks :

15. Calculate the temperature at which a perfectly black body radiates at the rate of 3 Wm^{-2}. (Stefan's constant = 5.67 × $10^{-8} Wm^{-2}K^{-4}$. Neglect surrounding temperature)

16. Determine the internal energy of one mole of an ideal monoatomic gas at 27°C (Universal gas constant R = 8.314 $Jmol^{-1}K^{-1}$).

17. A carnot engine is working between temperatures 27°C and 227°C.Find the efficiency of the engine.

18. Derive the expression for efficiency of a Carnot engine directly from a TS diagram.

19. 2 kg of water at 30°C is mixed with 4 kg of water at 50°C, under adiabatic conditions. Determine the increase in entropy of the universe (Specific heat capacity of water = 4186 $Jkg^{-1}K^{-1}$).

20. Find the rms speed of oxygen molecules at 27°C.   (4×3=12)

PART – D

Long Essay. Answer **any two** questions. **Each** carries **five** marks :

21. Explain the concept of temperature. Explain the principle of ideal gas thermometer.

22. Derive the expression for work done in changing the volume of a hydrostatic system. Explain the relation between PV diagram and work done.

23. State and prove Carnot's theorem and its corollary.

24. a) Explain four thermodynamic potentials.

    b) Explain Joule-Thomson expansion.

           (2×5=10)

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