3249

BOARD DIPLOMA EXAMINATION, (C-09)

MARCH/APRIL—2021

DME - THIRD SEMESTER EXAMINATION

THERMAL ENGINEERING - I

Time : 3 hours]   [*Total Marks* : 80

PART—A   4×5=20

Instructions :   (1) Answer *any* **five** questions.

(2) Each question carries **four** marks.

(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. State the second law of thermodynamics.

2. Write the relation between specific heat and gas constant.

3. What is meant by adiabatic process?

4. Represent constant temperature process on *P-V* diagram.

5. Mention any four types of solid fuels.

6. Mention any four types of gaseous fuels.

7. Represent Otto cycle on *P-V* diagram.

8. List four parameters that can be calculated from the steam tables.

9. Differentiate between wet steam and dry steam.

10. Mention any four applications of refrigeration.

15×4=60

Instructions : (1) Answer *any* **four** questions.

(2) Each question carries **fifteen** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. List and explain the three types of thermodynamic systems with examples.

12. *(a)* List and explain any one law of perfect gas.

(b) A Carnot engine is working between 550 °C and 60 °C. Determine the thermal efficiency of the engine.

13. 1 kg of air is heated in a closed rigid vessel such that its temperature changes from 27 °C to 427 °C. Find *(a)* change in internal energy, *(b)* work done and *(c)* heat transferred. Assume C_v = 0·718 kJ/kg-K; C_p = 1·005 kJ/kg-K.

14. 0·2 kg of gas at 20 bar undergoes constant pressure process in which the temperature is increased from 500 °C to 950 °C. Find *(a)* work done, *(b)* change in internal energy and *(c)* change in enthalpy. Assume R = 0·287 kJ/kg-K and C_p = 0·997 kJ/kg-K.

15. Describe with the help of neat sketch the Junkers gas calorimeter used for the determination of heating values of gaseous fuels.

16. Explain various processes of Carnot cycle with the help of *P-V* and *T-S* diagrams.

17. 1 m³ of steam at 2 bar and 40% wet is compressed to 10 bar according to the law $PV^{1.2}$ = C. Find *(a)* the final volume and dryness fraction and *(b)* the work done during compression. Neglect the volume of water.

18. List and explain any two methods of refrigeration.

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