C09–M–**305**

3249

BOARD DIPLOMA EXAMINATION, (C–09)

SEPTEMBER/OCTOBER - 2020

DME—THIRD SEMESTER EXAMINATION

THERMAL ENGINEERING—I

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

Uses of steam tables and Mollier diagram is allowed.

PART—A　　　　　3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** 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. State Avogadro's law.

3. What is meant by isothermal process?

4. What is throttling process?

5. Mention any six types of solid fuels.

6. Define lower calorific value of a fuel.

7. Define air standard efficiency of the cycle.

8. What is wet steam?

9. Find the enthalpy of steam at a pressure of 20 bar and dryness fraction 0·85 using steam tables.

10. Define coefficient of performance of a refrigerated system.

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PART—B
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10×5=50

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

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

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

11. *(a)* Explain briefly about the concept of flow work.

(b) A closed system executes a process during which 10 kJ of heat is supplied to the system. Find the change in internal energy under the following conditions :

(i) 5 kJ of work is done on the system

(ii) 2·5 kJ of work is done by the system

12. Explain about the following processes in gases with the help of *P-V* and *T-S* diagrams :

(a) Constant volume process

(b) Constant pressure process

13. 100 kJ of heat is added to 0·5 kg of air at constant volume whose initial temperature and pressure are 30 °C and 200 kPa. Take C_v 0·718 kJ/kg-K. Determine—

(a) final temperature;

(b) final pressure;

(c) change in entropy.

14. Explain about the construction and working of bomb calorimeter with a neat sketch.

15. Explain the working of Otto cycle with the help of *P-V* and *T-S* diagrams.

16. *(a)* Derive the relationship between specific heats and gas constant.

(b) A Carnot cycle operates between the temperature limits of 300 ºC and 40 ºC. The heat supplied to the system is 120 kJ. Determine—

(i) air standard efficiency;

(ii) work transfer.

17. 1 kg of steam at a pressure of 10 bar absolute and 0·8 dryness fraction expands during a non-flow polytropic process according to the law $PV^{1·3}$ constant, until its pressure becomes 2·8 bar. Determine—

(a) final condition of steam;

(b) work done;

(c) change in internal energy;

(d) heat transfer.

18. Write short notes on the following :

(a) Open-cycle air refrigeration

(b) Closed-cycle air refrigeration

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