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C14-M-304

4252

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH/APRIL—2021

DME - THIRD SEMESTER EXAMINATION

BASIC THERMODYNAMICS

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. What are the types of thermodynamic systems?
2. Define thermodynamic cycle.
3. State first law of thermodynamics.
4. State Boyle's law.
5. Define specific heat at constant pressure.
6. Write an expression for change of entropy in constant pressure process.
7. Define throttling process.
8. List out desirable characteristics of fuel.
9. Define calorific value of fuel.
10. What is meant by combustion of fuel?

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## PART—B

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. A system executes a cyclic process as follows :
- At point – 1, 20 kJ of heat is supplied and 3 kJ of work is done by the system.
- At point – 2, 2 kJ of heat is rejected and 5 kJ of work is done by the system.
- At point – 3, 15 kJ of heat is supplied and 9 kJ of work is done by the system.
- At point – 4, 20 kJ of heat is supplied to the system.
- What is the work is done at the fourth point?
12. (a) State Zeroth law of thermodynamics.  
(b) State Joule's law.
13. Derive the characteristic gas equation.
14. 1 kg of gas is heated from 25 °C to 200 °C. Estimate (a) change in enthalpy and (b) change in internal energy, if  $C_p = 0.98$  kJ/kgK and  $C_v = 0.73$  kJ/kgK.
15. 0.028 m<sup>3</sup> of air at a pressure of 7 bar and a temperature of 773 K is expanded at constant pressure to a volume of 0.034 m<sup>3</sup>. Find the change in entropy, if the characteristic gas constant is 0.287 kJ/kg/K and  $C_v$  is 0.692 kJ/kgK.

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16.  $0.12 \text{ m}^3$  of air at  $1.5 \text{ MPa}$  and  $1500 \text{ }^\circ\text{C}$  expands adiabatically to  $175 \text{ kPa}$  and  $690 \text{ }^\circ\text{C}$ . Find the work done if  $C_p = 1.0035 \text{ kJ/kg}^\circ\text{K}$  and  $C_v = 0.7165 \text{ kJ/kg}^\circ\text{K}$ .
17. Write the sequence procedure for determination of calorific value of fuel using bomb calorimeter.
18. Explain the working principle of Junker's gas calorimeter with a line diagram.

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