



C14-M-304

4251

BOARD DIPLOMA EXAMINATION, (C-14)
MARCH/APRIL—2018
DME—THIRD SEMESTER EXAMINATION
BASIC THERMODYNAMICS

Time : 3 hours]

[Total Marks : 80

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 *three* simple sentences.

1. Define the following terms :
(a) Thermodynamic system
(b) System boundary
2. What is a closed system? Give an example for it.
3. Write any three differences between heat and work.
4. State (a) Avogadro's law and (b) Regnault's law.
5. A certain gas has $C_p = 1.965$ kJ/kg-K and $C_v = 1.5$ kJ/kg-K. Find its molecular mass and gas constant.
6. Write a short note on entropy.
7. Draw P - V and T - S diagrams for constant volume process.

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8. List out any six desirable characteristics of fuel.
9. List out any six advantages of liquid fuel.
10. Define the following terms :
- (a) Conduction
- (b) Convection

PART—B

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. The efficiency of Carnot engine rejecting heat to a cooling pond at 28 °C is 30%. If the cooling pond receives 1050 kJ/min, what is the power developed by the cycle in kW? Also find temperature of the source.
12. Derive the gas equation $PV = nRT$.
13. (a) Explain quasi-static process.
- (b) A cylinder contains 3 kg of air at pressure of 200 bar and temperature of 27 °C, find the volume of air occupied by the gas. Assume R for air 0.287 kJ/kg-K.
14. Derive the expression for work done in an adiabatic process.
15. 0.5 kg of a gas having volume 0.28 m³ and pressure of 1.5 bar is compressed to a pressure of 15 bar according to $PV^{1.25} = C$. Find the amount of heat transferred during the process, the work done and the change of internal energy. Take $C_p = 1.04$ kJ/kg-K, $C_v = 0.74$ kJ/kg-K.
16. Derive expression for change in entropy on isothermal process.

17. A fuel has the following composition by mass :

Carbon = 86%

Hydrogen = 12%

Oxygen = 1%

Remaining unburnt matter

Calculate the theoretical air supply per kg of fuel and the mass of products of combustion per kg of fuel.

18. Explain the working of bomb calorimeter with legible sketch.
