



C16-M-303

6244

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER/NOVEMBER—2024

DME – THIRD SEMESTER EXAMINATION

THERMAL ENGINEERING-I

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 should not exceed five simple sentences.

1. If the pressure behind the piston remains constant at 700 kPa while the volume increases from 0.003m^3 to 0.024m^3 . Determine the work transfer across the boundaries.
2. Oxygen occupies a volume of 22.4m^3 per kg mole at NTP. Find its characteristics gas constant.
3. In a piston and cylinder arrangement air expands from a volume of 0.003m^3 to 0.024m^3 at a constant pressure of 690kN/m^2 . The amount of heat rejected through cylinder walls is 6 kJ . Determine the change of internal energy.
4. Draw P-V and T-S diagrams for isothermal process.
5. 100 kJ of heat is supplied to one kg of air at constant pressure. The temperature increased from 25°C to 120°C . Find the change in entropy.
6. What are the limitations of Carnot cycle?
7. What is the necessity of lubrication system in IC engine? List out the different methods of lubrication.

8. Define carburetion Write any two functions of a carburettor.
9. What is the need for controlling the pollution? Name any two commercially available equipment for pollution check.
10. Write any three differences between centrifugal compressor and axial flow compressor.

PART—B

10×5=50

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

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

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

11. A vessel of 2.5 m³ capacity contains one kg-mole of nitrogen at 110°C. If the gas is cooled to 35°C, calculate the final pressure, change in specific internal energy and specific enthalpy. Take $\gamma = 1.4$ and one kg-mole nitrogen is 28 kg. 10
12. (a) Define enthalpy and internal energy of a system
(b) 0.2 kg of gas is subjected to change of temperature from 288k to 458k at constant pressure. Find the heat transfer, Change of internal energy and change of enthaply if $C_p=1.0$ kJ/kgK and the adibatic index is 1.4. 4+6
13. A volume of 0.36m³ of oxygen initially at a temperature of 220°C and a pressure of 400kPa is compressed reversibly and isothermally to final volume of 0.06 m³. Calculate.

(a) The mass

(b) The final pressure

(c) The change in entropy

Assume $R = 0.26$ kJ/Kg K for oxygen

- 14.** A Carnot cycle heat engine operates between a source and sink temperatures of 227°C and 27°C . If the heat engine receives 425 kJ of heat from the source. Calculate,
- (a) Work done
 - (b) Heat rejected
 - (c) Efficiency of the cycle
- 15.** An engine operates on diesel cycle with the following data. 10
- Maximum temperature = 1400 K
Exhaust temperature = 700 K
Air is taken at 1 bar and 300 K
Find the expansion ratio, compression ratio and Air standard Efficiency of the cycle.
- 16.** Explain the working of battery ignition system of an IC engine with neat sketch. 10
- 17.** (a) Explain the method of finding the indicated power of an IC engine using Morse test. 6+4
- (b) Define the terms (a) Relative Efficiency (b) Thermal efficiency pertaining to IC engine.
- 18.** Explain the construction and working of a single acting, single stage reciprocating air compressor with neat sketch. 10

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