



C16-M-303

6244

BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY—2022

DME - THIRD SEMESTER EXAMINATION

THERMAL ENGINEERING – 1

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 five simple sentences.

1. State Boyle's and Charle's law.
2. How do you classify thermodynamic system? Give examples.
3. State and explain zeroth law of thermodynamics.
4. What is the difference between isentropic and adiabatic process?
5. Represent the following process on $P-V$ diagrams :
 - (a) Isothermal process
 - (b) Constant volume process
 - (c) Constant pressure process
6. Explain why Carnot cycle is practically impossible?

7. Write any three classification of IC engines.
8. Differentiate between HCV and LCV of fuel.
9. Define indicated power and brake power.
10. What is the multi-stage compression? State its advantage.

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 tank contains 1.6 m^3 of air at pressure 10 bar and temperature 27°C . Air is drawn off until the pressure is 550 kPa and the temperature drop to 15°C . Determine the mass of air drawn off. For air, take $R = 0.287 \text{ kJ/kgK}$.

12. Explain the following terms :

- (a) Internal energy
- (b) Enthalpy
- (c) Quasi-static work
- (d) Flow work

13. Air contained in a cylinder comprises the system. Cycle is completed as follows :

- (i) Piston does 105 kJ of work on air during its compression stroke while 65 kJ of heat are rejected to the surroundings which is mainly water in the jackets.
- (ii) On the expansion stroke, air does 120 kJ of work on the piston. Determine the quantity of heat added to the system.

14. One kg of air at a pressure of 140 kN/m^2 occupies 0.15 m^3 and from this condition it is compressed to 1.4 MN/m^2 according to the law $PV^{1.25} = C$. Determine the change in internal energy. Take $C_p = 1.005 \text{ kJ/kg-K}$, $C_v = 0.178 \text{ kJ/kg-K}$.
15. An oil engine operating on a ideal diesel cycle has a compression ratio $15 : 1$ and the fuel cut-off takes place at $1/5$ th of the stroke volume. Calculate the efficiency of the cycle. Take $\gamma = 1.4$.
16. Explain the construction and working of a Zenith carburettor with the help of a neat sketch.
17. A four cylinder, two stroke cycle petrol engine develops 30 kW at 2500 rpm . The mean effective pressure of each is 800 kN/m^2 and mechanical efficiency is 80% . Calculate the diameter and stroke of each cylinder if stroke to bore ratio is 1.5 . Also calculate the brake specified fuel consumption of the engine, if brake thermal efficiency is 28% . The calorific value of petrol is 44000 kJ/kg .
18. Explain the working of following rotary compressors with line diagram.
(a) Centrifugal compressor and (b) Axial flow type compressor.
