C16-M–303

6244

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER/NOVEMBER—2023

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 shall not exceed five simple sentences.

1. State the relation between characteristic gas constant and universal gas constant.

2. State the conditions for reversibility of a process and a cycle.

3. State Zeroth law of thermodynamics.

4. Represent constant volume process on p-V and T-s diagrams.

5. What is throttling process?

6. State any three assumptions made in the development of Carnot cycle.

7. What are the functions of carburettor?

8. State any six differences between SI and CI engines.

9. Define the terms indicated power and brake power.

10. What is the function of intercooler?

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. An ideal gas of mass 5 kg is being heated from 35 °C to 120 °C. Assuming R = 0·27 kJ/kg K and γ = 1·2 for the gas. Calculate *(a)* specific heats, *(b)* change in internal energy and *(c)* change in enthalpy.

12. Define thermodynamic system, surroundings, boundary and universe. Explain the thermodynamic systems with examples.

13. In a steady flow system, a fluid flows at a rate of 4 kg/s. It enters at a velocity of 300 m/s and enthalpy of 2330 kJ/kg at inlet. It leaves the system at a velocity of 150 m/s and its enthalpy at outlet is 1656 kJ/kg. During its passage through the system, fluid has a loss of heat transfer by 30 kJ/kg to the surroundings. Determine the power of the system in kW. Neglect any changes in the potential energy.

14. Gas at 1 bar and 15 °C has a specific volume of 0·75 m^3/kg. It is compressed adiabatically through a volume ratio 6 : 1. During the compression, the work energy transfer is 7·5 kJ and the final temperature of gas is 320 °C. Calculate the value of adiabatic index, gas constants, specific heats and mass of the gas involved.

15. A four cylinder petrol engine has a total swept volume of 2000 cm^3 and clearance volume in each cylinder is 60 cm^3. If the pressure and the temperature at the beginning of the compression is 1 bar and 24 °C and the maximum cycle temperature is 1400 °C, calculate

(a) air Standard efficiency

(b) heat supplied

(c) heat rejected

16. Explain the construction and working of battery ignition system with a neat sketch.

17. A Morse test was conducted on a 4-stroke petrol engine, the following data were obtained.

BP when all cylinders are working	=	16 kW
BP with cylinder No. 1 cut-off	=	9 kW
BP with cylinder No. 2 cut-off	=	11 kW
BP with cylinder No. 3 cut-off	=	10 kW
BP with cylinder No. 4 cut-off	=	9·5 kW

Find the indicated power of an engine and mechanical efficiency.

18. Estimate the work done by a two stage reciprocating single acting air compressor to compress 3 m^3 of air per min at 1 bar and 15 °C to a final pressure of 40 bar. The intercooler cools the air to 30 °C and 6 bar pressure. The law of compression in both stages is 1·3. Also calculate heat rejected in intercooler.

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