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C09–M–305

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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2014

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) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. What do you mean by density of a substance?

2. State the terms involved in the equation

$$C_v \quad \frac{R}{1}$$

3. Write the expression for entropy for a constant temperature process and state the parameters involved.

4. Why isothermal process is often referred to as hyperbolic process?

5. Define the term FUEL.

6. Write Dulong's formula for HCV. What is the significance of $\frac{O_2}{8}$ in the formula?

7. Show Otto cycle on *P-V* and *T-S* diagram.

8. Draw Mollier diagram (enthalpy-entropy) and show on it constant dryness fraction and constant pressure lines.

9. Write the expression for entropy of wet steam and describe the terms involved.

10. What is the principle of open air refrigeration?

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.

(4) Assume any missing data.

11. In a steady flow open system, a fluid substance flows at the rate of 5 kg/sec. It enters the system at a pressure of 500 kN/m^2, a velocity of 140 m/sec with internal energy 2000 kJ/kg and specific volume 0 4 m^3/kg. It leaves the system at a pressure of 125 kN/m^2, velocity of 100 m/sec with internal energy 1600 kJ/kg and specific volume of 1 m^3/kg. During its passage through the system, the substance lost heat of 40 kJ/kg to the surroundings. Determine the power of system stating whether it is from or to the system.

12. A quantity of gas has an initial pressure, volume and temperature of 150 kN/m^2, 0 14 m^3 and 25 °C respectively. It is compressed to a pressure of 1 5 MN/m^2 according to the law $PV^{1\,25}$ constant. Determine *(a)* work transfer to the gas, *(b)* heat transfer from the gas and *(c)* the change of entropy. [Take C_p 1 041 kJ/kg K, C_v 0 743 kJ / kg K.]

13. Certain mass of gas expanding reversibly at constant pressure does 10 kJ of work. Calculate the quantity of heat supplied and change in internal energy. Assume gas is perfect and 1 66.

14. Explain the working of Junkers gas calorimeter with a neat sketch.

15. A reversible engine converts 1/5th of the heat input into work. When the temperature of the sink is reduced by 40 °C, its efficiency is doubled. Find the temperature of the source and the sink.

16. Steam initially at a pressure of 14 bar and 250 °C expands isentropically to 2 bar. Find *(a)* the final condition, *(b)* work transfer and *(c)* change in internal energy.

17. Describe the process of steam jet refrigeration with the help of a neat sketch.

18. *(a)* Define and explain Boyle's law.

(b) An air standard diesel cycle has compression ratio of 15 and cut-off ratio of 2. Inlet pressure and temperature are 150 kPa and 350 K. Determine heat added per kg.

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