Roll No. ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚   **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech (ECE/EE) (Sem.–1,2)

ELEMENT OF MECHNICAL ENGG

Subject Code : ME-101

M.Code : 54012

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
 2. SECTION - B & C. have FOUR questions each.
 3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
 4. Select atleast TWO questions from SECTION - B & C.
 5. Assume any missing data suitably.

SECTION-A

1. **Write briefly :**

 a) What is an isothermal process?

 b) In how many forms can energy cross boundaries of a system?

 c) State zeroth law of thermodynamics.

 d) What is mechanical equivalent of heat?

 e) Differentiate between mass flow rate and volume flow rate.

 f) Name the four processes that make up the ideal Diesel cycle.

 g) What do you understand by strain energy?

 h) What is a reversible process?

 i) Define modulus of rigidity.

 j) What is a kinematic pair?

SECTION-B

2. Two kg of an ideal gas was heated under constant pressure conditions and it required 2300 kJ of heat to raise its temperature from 293 K to 373 K. When the same gas was heated under constant volume conditions, it required 1650 kJ of heat for the same temperature range. Find the values of C_p, C_v, adiabatic index and gas constant of the gas.

3. Derive the ideal gas equation and explain the open, closed and isolated systems.

4. A household refrigerator having COP =1.6 removes heat from the food chamber at the rate 64 kJ/min. Calculate the electric power being consumed by the refrigerator and the rate of the heat transfer to the kitchen. List the limitations of first law of thermodynamics.

5. During winter, a heat pump supplies heat to a house, which is maintained at 21 °C, at the rate of 72000 kJ/h, while consuming 7W of power? If the outside temperature is –3 °C, find if the heat pump satisfies the Clausius inequality.

SECTION-C

6. Explain and compare Otto cycle and Diesel cycle with their P-V and T-S diagrams and derive the expression for Mean Effective Pressure.

7. Explain the law of lifting machine with mechanical advantage and its maximum value.

8. Briefly explain the stress-strain curve of mild steel. Define Hardness, Ductility, Fatigue and Creep.

9 A round bar of steel 1 m long is 20 mm in diameter for half of its length and 25 mm diameter over the rest. A gradually applied axial load of 1 kN acts on it. Find the total strain energy and strain energy per unit volume. Take E =200 GN/m^2.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.