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## B.Tech. (2011 onwards) (Sem.–1,2) ELEMENTS OF MECHANICAL ENGINEERING Subject Code : BTME-101 Paper ID : [A1107]

Time: 3 Hrs.

Max. Marks : 60

## **INSTRUCTION TO CANDIDATES :**

- 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.

# **SECTION-A**

### 1. Write briefly :

- (a) What is Thermodynamics?
- (b) Define Energy.
- (c) Draw the PV and TS diagrams for isochoric process.
- (d) Define specific heats of gases.
- (e) What is Polytropic Process?
- (f) Define Entropy.
- (g) Draw the PV and TS diagram of Otto cycle.
- (h) What is Polymersiation?
- (i) Define Stress And Strain.
- (j) Define Moment of Inertia.

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#### **SECTION-B**

- 2. In a gas turbine unit, the gases flow through the turbine is 20 kg/s and the power developed by the turbine is 16000 KW. The enthalpies of gases at the inlet and outlet are 1260 KJ/kg and 400 KJ/kg respectively, and the velocity of gases at the inlet and outlet are 50 m/s and 110 m/s respectively. Calculate :
  - (a) The rate at which heat is rejected by the turbine.
  - (b) The area of the inlet pipe if the specific volume of the gases at inlet is  $0.40 \text{ m}^3/\text{kg}$ .
- 3. State and explain the second law of thermodynamics.
- 4. One kg of air enters a compressor at  $10^5$  Pa and 25°C having volume of 1.8 m<sup>3</sup> and is compressed to  $5 \times 10^5$  Pa isothermally. Determine :
  - (a) Work done
  - (b) Change in internal energy
  - (c) Heat transferred.
- 5. State and prove the Zeroth's law of thermodynamics.

### **SECTION-C**

- 6. Explain the working principle of Diesel cycle with the help of PV and TS diagrams.
- 7. (a) What are metals? How metals are different from non-metals?
  - (b) Write the composition, applications, advantages of cast iron and stainless steel.
- 8. (a) Derive the expressions for centroid of I and circular section.
  - (b) From a rectangular lamina ABCD in which AB = 60cm and BC = 40cm, a triangular piece OBC is removed such that CO = BO = 25cm. Calculate the CG of the remainder.
- 9. An engine working on Otto cycle has the following conditions :

Pressure at the beginning of compression =  $1 \times 10^5$  N/m<sup>2</sup>. Pressure at the end of compression = 10 bar. Calculate the air standard efficiency of the engine, Take y = 1.4.

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