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Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (2008-2010 Batches) (Sem.-1,2)**  
**ELEMENTS OF MECHANICAL ENGINEERING**  
Subject Code : ME-101  
Paper ID : [A0123]

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS 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 a quasi-static process?
  - (b) Define internal energy.
  - (c) Give the representation of throttling process on P-V chart.
  - (d) What is a cyclic heat engine?
  - (e) Give the Kelvin-Planck statement of the second law.
  - (f) Define the COP of a refrigerator.
  - (g) What is an air standard cycle?
  - (h) State the four processes of the Otto cycle.
  - (i) Differentiate between kinematic chain and mechanism.
  - (j) Define the term resilience.
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**SECTION-B**

2. Derive the expression for work done in a process in which  $pV^n = \text{constant}$ .
3. A mass of gas is compressed without friction from a state of  $0.3 \text{ m}^3$  and  $0.105 \text{ MPa}$  to a final state of  $0.15 \text{ m}^3$  and  $0.105 \text{ MPa}$ , there is a transfer of  $37.6 \text{ kJ}$  of heat from the gas during the process. How much does the internal energy of the gas change?
4. (a) Give the differential form of the steady flow energy equation.  
(b) Show that the enthalpy of a fluid before throttling is equal to that after throttling.
5. Three identical finite bodies of constant heat capacity are at temperature  $300, 300,$  and  $100\text{K}$ . If no work or heat is supplied from outside, what is the highest temperature to which any one of the bodies can be raised by the operation of heat engines or refrigerators?

**SECTION-C**

6. For the same compression ratio and heat rejection, which cycle is most efficient : Otto, Diesel or Dual? Explain with p-v and T-s diagrams.
  7. Discuss the following :
    - a) Oldham coupling
    - b) Reversibility of lifting machines.
  8. A concrete column,  $250\text{mm} \times 250\text{mm}$  in section, is-reinforced by 8 longitudinal  $15 \text{ mm}$  diameter round steel bars. The column carries a compressive load of  $300 \text{ kN}$ . Make calculations for the loads carried by and compressive stresses produced in the steel bars and concrete. Take  $E_s = 200 \text{ GN/m}^2$ ,  $E_c = 15 \text{ GN/m}^2$ .
  9. Write short notes on :
    - (a) Working of two stroke petrol engine
    - (b) Elliptical trammel
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