

Roll No.

Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (2012 to 2017) (Sem.-1, 2)
ELEMENTS OF MECHANICAL ENGINEERING
Subject Code : BTME-101
M.Code : 54101

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

Answer briefly / Fill in the blanks :

- 1) Define a Thermodynamics System.
- 2) Explain briefly zeroth law of thermodynamics.
- 3) What is Triple Point?
- 4) Define Internal Energy.
- 5) What do you mean by PMM of first kind?
- 6) Explain the concept of available and unavailable energy.
- 7) What is Air Standard Efficiency?
- 8) Define the term True Stress.
- 9) Under what conditions the center of mass and center of gravity coincide?
- 10) What is the difference between thermoplastic and thermosetting materials?

SECTION-B

- 11) To a close system 150kJ of work is supplied. If the initial volume is 0.6 m^3 and the pressure of the system changes as $p= 8-4V$, where p is in bar and V is in m^3 , **determine the final volume and pressure of the system.**
- 12) 0.1 m^3 of an ideal gas at 300K and 1 bar is compressed adiabatically to 8 bar. It is then cooled at constant volume and further expanded isothermally so as to **reach the condition** from where it started. Calculate :
- Pressure at the end of constant volume cooling
 - Change in internal energy during constant volume process
 - Net work done and heat transferred during the cycle. Assume $C_p = 4.3 \text{ kJ/kg K}$ and $C_v = 10.2 \text{ kJ/kg K}$.
- 13) Write down the general energy equations for steady flow system and **simplify when applied** to the following :
- Centrifugal water pump
 - Steam nozzle
- 14) A closed system contains at a pressure 1 bar, temperature 300 K and volume 0.018 m^3 . This system undergoes a thermodynamics cycle consisting of the following **three processes in series** :
- Constant volume heat addition till pressure becomes 5 bar,
 - Constant pressure cooling
 - Isothermal heating to initial state

Represent the cycle on T-S and p-V plots and evaluate the change in **entropy for each** process. $C_p=0.718 \text{ kJ/kg K}$ and $R = 0.287 \text{ kJ/kg}$

SECTION-C

- 15) An engine of 250 mm bore and 375 mm stroke works on otto cycle. **The clearance volume is 0.00263 m^3 . The initial pressure and temperature are 1 bar and 50°C . If the maximum pressure is limited to 25 bar, find the following :**
- a) Air standard efficiency of the cycle
 - b) The mean effective pressure of the cycle, Assume the ideal conditions.
- 16) Discuss briefly the method employed for improvement of thermal efficiency of open cycle gas turbines.
- 17) Discuss the following properties of the materials :
- a) Ductility
 - b) Resilience
 - c) Weldability
 - d) Plasticity
- 18) Determine the moment of inertia of a semicircular arc about its diameter and hence locate its centroid.

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.