

Roll No.

Total No. of Pages : 03

Total No. of Questions : 18

**B.Tech. (Aerospace Engg. / Automation & Robotics / Automobile Engg. /
BT / CE / CSE / Electrical & Electronics Engg. / Electrical Engg. / ECE /
Electronics & Electrical Engg. / IT / ME) (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.

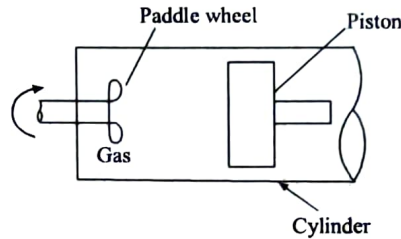
SECTION-A

Answer briefly / Fill in the blanks :

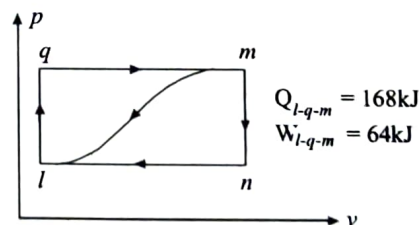
1. What do you understand by intrinsic properties? Give examples.
2. Define quasistatic process and list its salient characteristics.
3. Distinguish between point function and a path function.
4. Define thermodynamic equilibrium.
5. What is throttling process?
6. Temperature _____ (increases/ decreases / remains constant) during free expansion process.
7. Define air standard efficiency.
8. Define poisson's ratio and malleability.
9. Enumerate the salient features of magnetorheological materials.
10. Differentiate between centroid and centre of gravity.

SECTION-B

11. Figure shows a system comprising of gas in cylinder at pressure of 689 kPa. Fluid expands from a volume of 0.04 m^3 to 0.045 m^3 while pressure remains constant. Paddle wheel in the system does a work of 4.88 kJ on the system. Determine :
- Work done by system on the piston.
 - The net amount of work done on or by the system.



12. When a system is taken from state 1 to state m, in Figure 1, along path lqm, 168 kJ of heat flows into the system, and the system does 64 kJ of work :
- How much will be the heat that flows into the system along path lnm if the work done is 21 kJ?
 - When the system is returned from m to 1 along the curved path, the work done on the system is 42 kJ. Does the system absorb or liberate heat, and how much of the heat is absorbed or liberated?
 - If $U_1 = 0$ and $U_n = 84 \text{ kJ}$, find the heat absorbed in the processes ln and nm.



13. In a nozzle air at 627°C and twice atmospheric pressure enters with negligible velocity and leaves at a temperature of 27°C . Determine velocity of air at exit, assuming no heat loss and nozzle being horizontal. Take $C_p = 1.005 \text{ kJ/kg}\cdot\text{K}$ for air.

14. A reversible heat engine operates between two reservoirs at temperatures 700°C and 50°C . The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 50°C and -25°C . The heat transfer to the engine is 2500 kJ and the net work output of the combined engine refrigerator plant is 400 kJ . Determine the heat transfer to the refrigerant and the net heat transfer to the reservoir at 50°C .

SECTION-C

15. The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C . The amount of heat added to the air per cycle is 1500 kJ/kg .
- Determine the pressures and temperatures at all points of the air standard Otto cycle.
 - Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of $8 : 1$. Take for air: $c_v = 0.72\text{ kJ/kg K}$, and $\gamma = 1.4$.
16. Explain the working of two stroke petrol engine giving neat sketch.
17. Discuss the properties, salient features, advantages, disadvantages and applications of non ferrous materials.
18. Find the MI of the channel section shown in Figure given below about the X-X and Y-Y axis passing through its centroid.

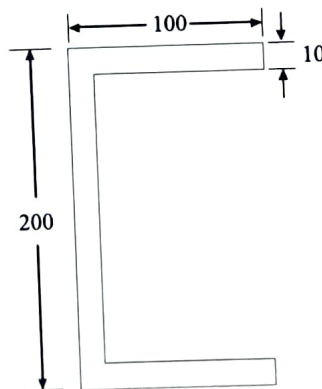


Fig.3

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.