Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 18

B.Tech (CSE) (Sem.–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.
5. Assume any missing data suitably.

SECTION-A

Answer briefly :

1. What is a quasi-equilibrium process?
2. State the conditions for a process to be reversible.
3. Define first law of thermodynamics.
4. Differentiate between mass flow rate and volume flow rate.
5. What is fatigue?
6. Explain why the carnot cycle is not suitable as an ideal cycle for all power cycles?
7. What do you understand by true stress?
8. What is an isobaric process?
9. Give two advantages of a two-stroke engine over four-stroke engine.
10. Differentiate between lower pairs and higher pairs.

SECTION-B

11. A reversible engine is supplied with heat from two constant temperature sources at 900 K and 600 K and rejects heat to a constant temperature sink at 300 K. The engine develops work equivalent to 90 kJ/s and rejects heat at the rate of 56 kJ/s. Estimate the heat supplied by each source and thermal efficiency of the engine.

12. A closed system undergoes a cycle of three processes. The first process is adiabatic and consists of 100 kJ of work done on the system. During the second process, 40 kJ of heat is transferred to the system with no work interaction. During the third process, the system does 180 kJ of work to return to the initial state. Find :

    a) The heat transfer during the third process.

    b) The net work done during the cycle.

13. Air enters an adiabatic nozzle steadily at 300 kPa, 350 K and 50 m/sec and leaves at 100 kPa and 320 m/sec. If the heat loss from this nozzle is 3.2 kJ/Kg of air flowing and inlet area is 0.01 m^2, find the exit temperature of air and exit area of the nozzle. Take R = 0.287 kJ/KgK and $\gamma = 1.4$.

14. What is the difference between a heat pump and a refrigerator? Show that the COP of a pump is greater than the COP of a refrigerator by unity.

SECTION-C

15. Explain the diesel cycle with the help of p-V and T-S diagrams and derive an expression for the ideal efficiency of a diesel cycle.

16. Explain the working of a two-stroke petrol engine with the help of neat sketches. What are the demerits of two-stroke engines?

17. In a lifting machine, an effort of 30 N is required to raise load of 1.0 kN. If the efficiency of the machine is 0.75, what is the velocity ratio? If on this machine, an effort of 65 N raised a load of 2 kN, what is now the efficiency?

18. A cylindrical test piece of diameter 25 mm was subjected to a tensile load of 40 kN. The measured extension was 0.08 mm over a gauge length of 200 mm and reduction in diameter was 0.0025 mm. Find the Young's modulus, Poisson's ratio, bulk modulus and shear modulus of the material.