

Roll No.

Total No. of Questions : 09]

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B.Tech. (Sem. - 1st/2nd)

ELEMENTS OF MECHANICAL ENGINEERING

SUBJECT CODE : ME-101 (2k4 & Onwards)

Paper ID : [A0114]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Five** questions from Section - B & C.
- 3) Select atleast **Two** questions from Section - B & C.

Section - A

Q1)

(Marks : 2 each)

- a) How is the property of system classified?
- b) What do we understand by energy in Transit?
- c) Differentiate between the adiabatic and polytropic process.
- d) Why C_p is greater than C_v ?
- e) What are the assumptions for steady flow process?
- f) Sketch the Carnot cycle on P-V and T-S diagram.
- g) Define the mean effective pressure for Reciprocating engine.
- h) State the law of lifting of machine.
- i) What is kinematic link.
- j) Sketch a Stress-Strain for ductile and brittle materials and show the salient point on it.

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Section - B

(Marks : 8 each)

- Q2) (a) Define and explain the Zeroth law of thermodynamics. Why is it so called.
- (b) A non flow reversible process occurs for which pressure and volume are correlated by the expression $PV=150$, where V is the volume in m^3 and p is the pressure in bar. Make calculations for the work done on or by the system as pressure increases from 10 bar to 100 bar. Indicate the nature of process, whether expansion or compression.
- Q3) (a) How are the state parameters P , V and T related in a polytropic process? What are the values of polytropic exponent for isochoric, isothermal and adiabatic process.
- (b) Show that the internal energy is a property of the system.
- Q4) The gas leaving the turbine jet engine flows steadily into the Jet pipe with enthalpy 960 kJ/kg and velocity 250 m/s relative to the pipe. The exit from the pipe is at enthalpy 860 kJ/kg, and the exhaust is in line with intake. Neglecting heat loss from the system, determine the relative velocity of gas leaving the pipe.
- Q5) Explain the establishment of thermodynamic temperature scale. Why is thermodynamic temperature scale called the absolute temperature scale.

Section - C

(Marks : 8 each)

- Q6) Derive an expression for the air standard efficiency and mean effective pressure of an Otto cycle. State the assumptions made.
- Q7) (a) Discuss briefly the working of a 4 stroke diesel engine.
- (b) Make a labelled sketch of Oldham coupling?
- Q8) Discuss the various inversion of double slider crank chain mechanism.
- Q9) An unknown weight falls 4 cm on to a Collar rigidly attached to the lower end of a vertical bar 4 m long and 8 cm^2 in section. If the maximum instantaneous extension is found to be 0.42 cm. Find the corresponding stress and the value of unknown weight $E = 200 \text{ kN/mm}^2$.

