

III/SEM/ELECTRICAL/2015 (W)

(2)

ELEMENTS OF MECHANICAL ENGINEERING

Sub Code-MET 321

Full Marks : 70

Time : 3 hours

Answer any five questions

The figures in the right-hand margin indicate marks

Use of Steam Table is allowed

1. (a) Define heat and its unit. 2

(b) Derive the general gas equation $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ 5

(c) Steam is being generated in a boiler under a pressure of 10 bar. Find the enthalpy of 100 kg of steam when (i) steam is dry saturated (ii) dryness fraction of steam is 0.95 (iii) temperature of steam is 250 °C,

Take $C_p = 2.1 \frac{kJ}{kg K}$. 7

2. (a) Define steam and use of steam. 2

(b) Explain 'Dryness fraction of steam'. Degree of superheat and wet steam. 5

(c) The initial pressure and temperature of certain quantity of air contained in a closed vessel are 15 bar and 30 °C respectively. Air is heated until its temperature rises to 100 °C. Determine the final pressure. 7

3. (a) Define mountings of a boiler with examples. 2

(b) What are the classification of steam boilers? 5

(c) With a neat sketch explain the construction and working of Cochran boiler. 7

4. (a) What is diagram factor? 2

(b) Compare between impulse turbine and reaction turbine. 5

(c) In a single cylinder double acting steam engine, steam is admitted at a pressure of 12 bar and is exhausted at 1.3 bar. The cylinder bore is 250 mm and stroke length is 450 mm. The cut off takes place at 40% of the stroke. The engine speed is 260 rpm. Neglecting clearance and assuming a diagram factor of 0.9. Determine the indicated power of the engine. 7

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- 5. (a) What is **mechanical efficiency**? 2
- (b) Differentiate between two stroke and four stroke engine. 5
- (c) Describe the working of a **surface condenser** with a neat sketch. 7
- 6. (a) Define viscosity and its unit. 2
- (b) Explain the different type of energies of a liquid in motion. <http://www.sctevtonline.com> 5
- (c) The diameters of a pipe at the Section 1 and 2 are 15 cm and 20 cm respectively. Find the discharge through the pipe if velocity of water at Section 1 is 4 m/sec. Determine also the velocity at Section 2. 7
- 7. (a) Write down the pressure measuring instruments. 2
- (b) Derive Continuity Equation. 5
- (c) What is the function of Hydraulic lift and

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describe working principle of Hydraulic lift with neat sketch. 7

Or

Derive theoretical mean effective pressure of a steam engine without clearance.

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