

Total Pages—4 III—Sem/MECH/2014 (W)(New)

(2)

THERMAL ENGG-I

(Code – MET-303)

Full Marks : 70

Time : 3 hours

Answer any five questions

Figures in the right-hand margin indicate marks

Steam table is allowed.

- 1. (a) Differentiate between path and process. 2
- (b) What do you mean by thermodynamic equilibrium? Explain briefly. 5
- (c) The pressure of the gas supplied to an engine is measured as 76.2 mm of water gauge. If the barometer reads 740 mm of Hg. What is the absolute pressure of the gas in mm of Hg and kPa? 7
- 2. (a) What are the difference modes of heat transfer? 2

- (b) Mention the similarities and differences between heat and work. 5
- (c) What do you mean by sensible heat, latent heat and specific heat? Explain in details. 7
- 3. (a) State 1st law of thermodynamics based upon system and its change of state points. 2
- (b) Find out the relation between P & T (pressure and temp.) during an adiabatic change. 5
- (c) 0.25 m³ of a gas at 288 K and 100 kPa is compressed adiabatically to 700 kPa. Calculate
 - (i) The final temp. of the gas
 - (ii) The workdone on the gas.
 Take $C_p = 1.001 \text{ kJ/kg K}$ & $C_v = 0.715 \text{ kJ/kg K}$. 7
- 4. (a) What do you mean by refrigeration? 2
- (b) What is a nozzle? Apply steady flow energy equation to it and derive a relation between velocity and enthalpy change. 5

(Turn Over)

(3)

- (c) Explain carnot cycle and mention why it is impossible to construct. 7
- 5. (a) State Clausius' statement of 2nd law of thermodynamics. 2
- (b) In a heat engine, the temp. of the source and sink are 700°C and 50°C respectively. The heat supplied is 5 MJ/Min. Find the power developed by the engine. 5
- (c) An inventor claims to have developed a refrigerating m/c which operates between -20°C and 30°C and consumes 1 kW power. The machine gives a refrigerating effect of 21.6 MJ/hour. Comment on the claim of the inventor. <http://www.sctevtonline.com> 7
- 6. (a) Define 'pure substance'. 2
- (b) Graphically represent the formation of steam (from solid state to gaseous state) on temperature enthalpy chart. 5

http://www.sctevtonline.com

(4)

- (c) A sample of wet steam exists at 5 bar and possesses dryness fraction of 0.95. With the help of steam table, determine its temperature, enthalpy and specific volume. 7
 - 7. (a) State 'Avogadro's hypothesis'. 2
 - (b) Prove $C_p - C_v = R$. 5
 - (c) A closed vessel contains 2 kg of carbon dioxide at temperature 20°C and pressure 0.7 bar. Heat is supplied to the vessel till the gas acquires a pressure of 1.4 bar. Calculate : (i) Final temp. (ii) Workdone on or by the gas (iii) Heat added (iv) Change in internal energy. 7
- Take $C_p = 0.657 \text{ kJ/kg K}$.

http://www.sctevtonline.com

http://www.sctevtonline.com

<http://www.sctevtonline.com>

Whatsapp @ 9300930012

Your old paper & get 10/-

पुराने पेपर्स भेजे और 10 रुपये पायें,

Paytm or Google Pay से