Reg. No. : | | | | | | | | | | |

Question Paper Code: 33703

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Third Semester

Mechanical Engineering

01UME303 - ENGINEERING THERMODYAMICS

(Use of steam tables, charts may be permitted)

(Regulation 2013)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. Which of the following is point function?

   (a) entropy (b) enthalpy (c) work (d) none

2. The ratio of specific heat capacities at constant volume and constant pressure for air is

   (a) 1.4 (b) 0.714 (c) 1.005 (d) 0.718

3. Which of the following is correct?

   (a) $COP_{HP} = 1+COP_{Ref}$ (b) $COP_{Ref} = 1+COP_{HP}$

   (c) $COP_{HP} + COP_{Ref} = 1$ (d) none

4. No engine which gives higher efficiency other than Carnot engine when working at same temperature limits is called

   (a) Kelvin statement (b) Clausius statement
   (c) Carnot theorem (d) Clausius inequality

5. The heat absorbed by water at its saturation temperature to get converted into dry steam at the same temperature is called

   (a) sensible heat (b) specific heat (c) total heat (d) latent heat

6. For a given set of operating pressure limits of a Rankine cycle the highest efficiency occurs for

(a) Saturated cycle (b) Superheated cycle
(c) Reheat cycle (d) Regenerative cycle

7. The difference of specific heats for the ideal gases is

(a) Joule - Thomson coefficient (b) Characteristics gas constant
(c) Molecular mass (d) None

8. Isothermal compressibility α

(a) $\alpha = -\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$ (b) $\alpha = -\frac{1}{V}\left(\frac{\partial P}{\partial V}\right)_T$
(c) $\alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_P$ (d) $\alpha = -\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

9. A humidification process means

(a) Decrease in relative humidity (b) An increase in specific humidity
(c) A decrease in temperature (d) An increase in temperature

10. In an adiabatic saturation process

(a) The enthalpy remains constant

(b) The temperature remains consta

(c) The absolute humidity remains constant

(d) The relative humidity remains constant

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. Air flows steadily at the rate of 0.4 *kg/s* through an air compressor, entering at 6 *m/s* with a pressure of 1 *bar* and a specific volume of 0.85 m^3/kg and leaving at 4.5 *m/s* with a pressure of 6.9 *bar* and a specific volume of 0.16 m^3/kg. The internal energy of air leaving is 88 *kJ / kg* greater than that of the air entering. Cooling water in a jacket surrounding the cylinder absorbs heat from the air at the rate of 59 *W*. Calculate the power required to drive the compressor and the inlet and outlet cross sectional areas. (8)

12. Two reversible heat engines *A* and *B* are arranged in series. Engine *A* rejecting heat directly to engine *B,* receives 200*kJ* at a temperature of 421°*C* from a hot source,

while engine *B* is in communication with a cold sink at a temperature of 4.4°*C*. If the work output of *A* is twice that of *B*, find (i) The intermediate temperature between *A* and *B* (ii) the efficiency of each engine (iii) The heat rejected to the cold sink. (8)

13. A vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam at a temperature of 250^oC. The mass of the liquid present is 9 *kg*. Find the pressure, the mass, the specific volume, the enthalpy, the entropy and the internal energy of the mixture. (8)

14. Explain and derive the (i) Joule-Thomson co-efficient (ii) Clausius Clapeyron equation. (8)

15. Air at 20^oC, 40% R.H is mixed with air at 40^oC, 40% R.H in the ratio of (former) 1:2 (later) on dry basis. Determine the final condition of air. (8)