A   Reg. No. :

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Third Semester

Mechanical Engineering

15UME303 - ENGINEERING THERMODYNAMICS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The Second law of thermodynamics deals with   CO1- R

   (a) Temperature   (b) Entropy   (c) Enthalpy   (d) Work

2. The unit of power in SI unit is   CO1- R

   (a) Watt   (b) Nmm   (c) Nm   (d) Pa

3. The co-efficient of performance of the refrigerator is the ratio of   CO2- R
   Heat absorbed to

   (a) Heat input   (b) Work output   (c) Work input   (d) Heat rejected

4. The PMM- I kind violates _____ law of thermodynamics   CO2- R

   (a) Zeroth   (b) First   (c) Second   (d) Third

5. The thermodynamic cycle used in Steam power plant is   CO3- R

   (a) Otto cycle   (b) Rankine cycle   (c) steam cycle   (d) None of these

6. In throttling process, which property remains constant   CO3- R

   (a) Pressure   (b) Temperature   (c) Enthalpy   (d) Entropy

7. Characteristic gas constant of a gas is equal to   CO4- R

   (a) $C_P - C_v$ (b) $C_P + C_v$ (c) C_P / C_v (d) $C_P * C_v$

8. Clapeyron equation is applicable for   CO4- R

   (a) Saturation point of vapour   (b) Saturation point of liquid

   (c) Triple point   (d) Boiling point

9. The dry bulb temperature is equal to Wet bulb temperatue at RH is equal to   CO5- R

   (a) 100 %   (b) 50 %   (c)0 %   (d)None of these

10. In sensible cooling process, _____temperature remains constant.   CO5- R

   (a) Wet bulb   (b) Dry bulb   (c) Dew point   (d) None of these

PART – B (5 x 2= 10 Marks)

11. Distinguish between point and path function   CO1- R

12. State Clausius statement related to Law of thermodynamics   CO2- R

13. Explain degree of superheat of a superheated steam.   CO3- R

14. Write down the van der waals equation.   CO4- R

15. What do you mean by relative humidity?   CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) A fluid is confined in a cylinder by spring loaded frictionless piston so that the pressure in the fluid is a linear function of the volume $p = a + bV$. The internal energy is defined by the relation $U = 34 + 3.15\ pV$. Where u is in kPa, p is in kPa and v is in cubic metres. If the fluid changes from 170 kPa , 0.03 m^3 to 400 kPa , 0.06 m^3 with no work other than that done on the piston. Determine the work transfer and heat transfer.   CO1- App   (16)

Or

   (b) Apply the concept of first law of thermodynamics to the open flow system and derive the Steady Flow Energy Equation.   CO1- App   (16)

17. (a) Establish Clausius in equality. State its value for reversible and irreversible processes.   CO2- App   (16)

Or

   (b) A cyclic heat engine operates between the temperature limits of 900° C and 30° C. What is the least rate of heat rejected from the engine per kW net work output of the engine?   CO2- App   (16)

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18. (a) The steam at 20 bar and 350 ° C is admitted into a steam turbine   CO3- App   (16)
of a Rankine cycle where it is expanded is entropically to a back
pressure of 0.1 bar. Assume all ideal processes; determine the
work done per kg of steam and efficiency of the rankine cycle.

Or

(b) A vessel of volume 0.04 m^3 contains a mixture of saturated water   CO3- App   (16)
and saturated steam at a temperature of 250° C. The mass of water
is 9 kg. Determine pressure, specific volume, specific entropy and
specific enthalpy of the mixture.

19. (a) Deduce maxwell's relations and state their uses.   CO4- U   (16)

Or

(b) Derive Clausius - cleyperon equations and explain its   CO4- U   (16)
significances.

20. (a) Atmospheric air at 1.0132 bar has 20°c DBT and 65% RH Find   CO5- App   (16)
the humidity ratio, new point temperature, degree of saturation,
enthalpy of mixture, density of air and density of vapour.

Or

(b) Determine the properties of air at atmospheric pressure (1.01325   CO5- App   (16)
bar) has a dry bulb temperature of 32°C and wet bulb temperature
of 24° C.

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