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Question Paper Code: 93703

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

Third Semester Mechanical Engineering

19UME303– ENGINEERING THERMODYNAMICS

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Mass Transfer cannot take place in CO1- R
(a) open system (b) closed system (c) Isolated system (d) None the above
2. Which one is application of SFEE? CO1- R
(a) IC Engines (b) Evaporator (c) Condenser (d) Both b & c
3. The efficiency of Carnot cycle depends upon CO2- R
(a) temperature limits (b) pressure ratio
(c) volume compression ratio (d) cut-off ratio and compression ratio
4. What is the relation between COP of heat pump and refrigerator CO4- R
(a) COP of pump = COP of refrigerator-1 (b) COP of pump = COP of refrigerator+1
(c) COP of pump = COP of refrigerator-2 (d) COP of pump = COP of refrigerator+2
5. Pure substance example is CO1- R
(a) H₂ (b) Table Salt (c) Gold (d) All the above
6. What is the actual turbine inlet temperature in Rankine cycle? CO4- R
(a) 700⁰C (b) 800⁰C (c) 550⁰C (d) 1150⁰C
7. Which of the following relation is correct? CO5- R
(a) $dU=TdS-pdV$ (b) $dH=TdS+Vdp$
(c) $dG=Vdp-SdT$ (d) all of the above

8. Maxwell's equations consists of ____ equations. CO5- R
 (a) four (b) three (c) two (d) one
9. In sensible heating or cooling CO1- R
 (a) work done remains constant (b) dry bulb temperature or air remains constant
 (c) both of the mentioned (d) none of the above
10. The wet bulb temperature is the ____ temperature recorded by CO1- R
 moistened bulb.
 (a) lowest (b) highest
 (c) atmospheric (d) none of the mentioned

PART – B (5 x 2= 10 Marks)

11. State First Law of Thermodynamics for closed system. CO3- U
12. State Kelvin Planck's second law of thermodynamic. CO4- U
13. What do you understand by pure substance? Give Examples CO1- U
14. What is Clausius Clapeyron equation? CO5- U
15. Define Relative Humidity CO6- R

PART – C (5 x 16= 80 Marks)

16. (a) Derive steady flow energy equation and apply it to deduce an CO3-App (16)
 expression for steam turbine.
 Or
 (b) Derive steady flow energy equation and apply it to deduce an CO3-App (16)
 expression for steam nozzle
17. (a) A Heat engine supply 19 KW of heat from 565K substance and CO4-Ana (16)
 reject heat to 282.5K to reservoir . which of the following engine
 is reversible, irreversible and impossible Engine CASE 1- If
 14.0833KW of heat is rejected CASE 2- If 4.75 KW of heat is
 rejected CASE 3- If 9.5 KW of heat is rejected , By using carnot
 and Clausius inequality method
- Or
- (b) A Reversible Heat Engine operates between two reservoirs at CO4-App (16)
 temperature of 600°C and 40°C .The engine drives a reversible
 refrigerator which operates between reservoir at a temperature of
 40°C and -20°C . The heat to the heat engine is 2000 KJ and the
 net work output of the combined engine and refrigerator plant is
 360 KJ. Evaluate the heat transfer to the refrigerator and net heat
 transfer to the reservoir at 40°C

- 18 (a) Discuss the different phase change zones of T-S Diagram for water when the temperature rises from solid phase to superheated phase CO1-U (16)
- Or
- (b) A Vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam at a temperature of 250°C . The mass of liquid present is 9 Kg. Find the Pressure, Mass, Specific Volume, Specific Entropy, Specific Enthalpy, Specific Internal Energy CO1-App (16)
- 19 (a) Derive Tds equation when (i) T and V independent (ii) T and P independent CO5-U (16)
- Or
- (b) Explain the Joule Thomson coefficient with the help of T-p diagram and derive the expression for joule Thomson coefficient. Show that the value of this coefficient for an ideal gas is zero CO5-U (16)
- 20 (a) Explain the various psychometric process with neat sketches CO1-U (16)
- Or
- (b) An air conditioning system has the following conditions 1) outdoor conditions 32°C dry bulb temperature and 75% relative humidity 2) required indoor conditions 25°C DBT and 70% relative humidity, amount of pre air circulated $200 \text{ m}^3/\text{min}$ per person 3) seating capacity 50 person to required conditions is achieved first by cooling and dehumidification and then heating Determine the following 1) capacity of cooling coil in tonnes 2) capacity of heating coil iii) Mass of water vapour removed if coil dewtemp 14°C CO6-App (16)

