Register No.:   ....   Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023
MECHANICAL ENGINEERING
(2020 SCHEME)

Course Code :   20MET303

Course Name: Thermal Engineering

Max. Marks :   100   **Duration: 3 Hours**

Use of Steam tables. Refrigeration tables, Charts and Psychrometric charts are permitted.

PART A
(Answer all questions. Each question carries 3 marks)

1. Compare fire tube and water tube boilers.
2. What is the effect of supersaturation in the case of a nozzle?
3. What is Reheat factor?
4. Explain stage efficiency in the case of a steam turbine.
5. With a neat diagram explain Turbo charging.
6. Define any two efficiency terms used in an I.C. engine.
7. List the effective methods for emission controls in I.C. engines.
8. Define the term stoichiometric air fuel ratio.
9. What do you mean by COP?
10. List the basic Psychrometric processes in air conditioning.

PART B
(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Dry saturated steam at 10 bar expanded isentropically in a nozzle   (8)
        to 0.1 bar. Find the dryness fraction of the steam at exit. Also find
        the velocity of steam at exit.
    b) Draw the P–V diagram and T-S diagram of modified Rankine cycle   (6)
        denoting all the points involved.

OR

12. a) With a neat diagram, Explain the working of a Binary Vapor cycle.   (12)
    b) Define nozzle efficiency.   (2)

MODULE II

13. a) With neat sketch, explain any two governing methods used in steam turbines. (8)

     b) Draw the combined velocity triangle for an Impulse steam turbine. Enumerate all the notations used in the triangle. (6)

OR

14. a) The velocity of steam leaving the nozzles of an Impulse turbine, is 1200m/s and the nozzle angle is 20^0. The blade velocity is 375m/s and blade velocity coefficient is 0.75. Assuming no loss due to shock at inlet, calculate for a mass flow of 0.5kg/s and symmetrical blading (a) blade inlet angle; (b) driving force on wheel; (c)axial thrust on wheel; (d)power developed by the turbine. (8)

     b) Explain pressure velocity compounding in the case of an impulse turbine? (6)

MODULE III

15. a) Explain in detail the Morse test conducted on any of the IC engines? (8)

     b) Explain the terms mean effective pressure, indicated power and brake thermal efficiency? (6)

OR

16. a) The compression ratio of an ideal air standard Diesel cycle is 15. The heat transfer is 1465 kJ/kg of air. Find the pressure and temperature at the end of each process and determine the cycle efficiency. What is mean effective pressure of the cycle, if the inlet conditions are 300 K and 1 bar? (12)
Take C_p for air = 1.005 kJ/kg K and C_v for air = 0.712 kJ/kg K.

     b) What is the significance of supercharging in an I.C. engine? (2)

MODULE IV

17. a) With the help of a pressure – crank angle diagram, explain different stages of combustion in S.I. engine. (8)

     b) Explain the effect of engine variables on detonation. (6)

OR

18. a) With the help of a pressure – crank angle diagram, explain different stages of combustion in C.I. engine. (8)

     b) Describe different types of S.I. Engine combustion chambers with diagrams. (6)

MODULE V

19. a) What is the effect of subcooling of liquid refrigerant on the performance of a Vapour compression refrigeration system?   (8)

     b) Expand the acronyms (i) DBT, (ii) RH, (iii) WBT and (iv) DPT   (6)

OR

20. a) Give the classification of air conditioning systems. With a schematic diagram describe summer air conditioning system   (10)

     b) What are the major factors that influence human comfort?   (4)

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