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**Question Paper Code: 34704**

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

Fourth Semester

Mechanical Engineering

01UME404 – THERMAL ENGINEERING

(Regulation 2013)

(Use of Steam table, Psychrometric chart are permitted)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Sketch the PV and TS diagram of Diesel cycle.
2. Define mean effective pressure.
3. Differentiate between brake power and indicated power of an IC engine.
4. What are the exhaust emissions from a diesel engine?
5. What is critical pressure ratio of a steam nozzle?
6. What is blading efficiency?
7. Define volumetric efficiency.
8. What is meant by inter cooler?
9. Define tonne of refrigeration.
10. How does humidity affect human comfort?

PART - B (5 x 16 = 80 Marks)

11. (a) An engine working on Otto cycle has a volume of  $0.45 \text{ m}^3$ , pressure of 1 *bar* and temperature of  $30^\circ \text{ C}$  at the beginning of compression stroke. At the end of compression stroke the pressure is 11 *bar*. The heat of 210 *kJ* of heat is added at constant volume. Determine (i) pressure, temperature and volume at salient points (ii) percentage clearance, (iii) efficiency, (iv) net work per cycle, (v) MEP, (vi) ideal power developed by the engine if the number of working cycles per min is 210. (16)

Or

- (b) Draw the actual and theoretical p-v diagrams of a four stroke diesel engine and compare them. (16)

12. (a) With a neat sketch explain the working principle of a simple carburetor. (16)

Or

- (b) (i) Explain the working of 4-stroke cycle diesel engine with neat sketch. (10)  
(ii) Differentiate between the SI and CI engines. (6)

13. (a) What is velocity compounding? List advantages and limitations of velocity compounding. (16)

Or

- (b) Steam at 10.5 *bar* and 0.95 dryness is expanded through a convergent-divergent nozzle. The pressure of steam leaving the nozzle is 0.85 *bar*. Find, (i) velocity of steam at throat for maximum discharge (ii) area at exit (iii) steam discharge if the throat area is  $1.2 \text{ cm}^2$ . Assume the flow is isentropic and there are no friction losses. Take  $n=1.135$ . (16)

14. (a) In a two stage compressor in which inter cooling is perfect, prove that work done in the compressor is minimum when the pressure in the inter cooler is geometric mean between the initial and final pressure. Draw the P-V and T-S diagram for two stage compression. (16)

Or

- (b) (i) State the advantages and disadvantages of staging of compressors. (8)
- (ii) A two stage air compressor compresses air from 1 bar  $20^{\circ}\text{C}$  to 42 bar. It follows  $PV^{1.35}=C$ . The inter cooling is perfect. Find
- (a) WD
- (b) mass of cooling water needed in inter cooler if water temperature raise is  $25^{\circ}\text{C}$ . (8)
15. (a) (i) Explain with neat sketch about the Vapour Li-Br vapor absorption Refrigeration system. (10)
- (ii) Explain sensible heating and cooling and Tonne of Refrigeration. (6)

Or

- (b) Atmospheric air at 1.0132 *bar* has a Dry Bulb Temperature of  $32^{\circ}\text{C}$  and Wet Bulb Temperature of  $26^{\circ}\text{C}$ . Compute (i) the partial pressure of water vapour, (ii) the specific humidity, (iii) the Dew Point Temperature, (iv) the Relative Humidity, (v) the degree of saturation, (vi) the density of air in the mixture, (vii) the density of vapour in the mixture and (viii) the enthalpy of the mixture. (16)

