21819

3 Hours / 100 Marks   Seat No.

Instructions :   (1)   All Questions are *compulsory.*

          (2)   Illustrate your answers with neat sketches wherever necessary.

          (3)   Figures to the right indicate full marks.

          (4)   Assume suitable data, if necessary.

          (5)   Use of Non-programmable Electronic Pocket Calculator is permissible.

          (6)   Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

          (7)   Use of Steam tables, logarithmic, Mollier's chart is permitted.

                                                                                 Marks

1.   **Attempt any FIVE :** $5 \times 4 = 20$

     (a)   Define :

          (i)   Intensive property

          (ii)   Extensive property

     (b)   Represent 'Isentropic process' on 'P-V' and 'T-S' diagram.

     (c)   State the significance of 'Universal gas constant'.

     (d)   Enlist the functions of 'steam condenser'.

     (e)   Explain the working principle of 'steam power plant.

     (f)   Explain the term :

          (i)   Clearance Ratio

          (ii)   Indicated power related to compressor

     (g)   Represent 'Diesel Cycle' on P-V' and 'T-S' diagram.

2. **Attempt any FOUR :** 4 × 4 = 16

   (a) Explain with example the concept of "Perpetual motion of machine'.

   (b) State Second Law of Thermodynamic with suitable example.

   (c) A quantity of gas has a volume 0.14 m^3, pressure 1.5 bar and temperature 100 °C. If the gas is compressed at a constant pressure, until its volume becomes 0.112 m^3, determine the temperature at the end of compression and work done.

   (d) Differentiate between Boiler mountings and accessories.

   (e) State the necessity of 'Compounding of Turbine'. Name different methods of compounding.

   (f) Draw the label diagram of vapour compression refrigeration system. Represent it on P-H & T-S chart.

3. **Attempt any TWO :** 2 × 8 = 16

   (a) Explain the working of 'La-Mont' Boiler with neat sketch.

   (b) State the effect of 'super heating' and 'sub cooling' on the performance of vapour compression refrigeration cycle with 'P-H' and 'T-S' diagram.

   (c) Explain the construction of 'Axial flow compressor' with neat sketch.

4. **Attempt any FOUR :** 4 × 4 = 16

   (a) Explain :

   (i) Forced draught

   (ii) Inducted draught

(b) Represent vapour compression cycle on 'P-H' and 'T-S' diagram when refrigerant is dry and saturated at the inlet to the compressor.

(c) State the advantages and disadvantages of multi-stage compressor.

(d) Classify I.C. engine.

(e) Explain :

(i) Scavenging

(ii) Detonation

(f) Compare between 'Heat engine' and 'Heat pump'.

5. **Attempt any TWO :** 2 × 8 = 16

(a) Explain the working of two-stroke petrol engine with neat sketch.

(b) A certain quantity of air at a pressure of 1 bar and temperature 70 °C is compressed reversibly and adiabatically until pressure is 7 bar in an Otto cycle engine. 460 kJ of heat per kg of air is added at constant volume. Determine :

(i) Compression ratio of engine

(ii) Temperature at the end of compression

(iii) Temperature at the end of heat addition

Represent cycle on P-V and T-S diagram.

(c) A furnace wall is made up of refractory bricks of 300 mm thick. The inner and outer surface of the wall have temperature 1000 °C and 150 °C. Find heat lost per square meter per hour.

If outside temperature becomes 50 °C, the furnace wall is covered by insulating brick of 200 mm thickness, find the reduction in heat loss. Take 'K' for refractory and insulating bricks as 4.5 W/m °K and 0.5 W/m °K.

6. **Attempt any FOUR :** 4 × 4 = 16

    (a) State 'Fourier's law of heat conduction.

    (b) Define :

        (i) Emissivity

        (ii) Transmissivity

    (c) Enlist the advantages and disadvantages of plate type heat exchanger.

    (d) Compare between conduction and convection.

    (e) Explain term :

        (i) Black body

        (ii) Gray body

    (f) List the different lubricant additives. State its advantages.

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