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Instructions –   (1) All Questions are *Compulsory*.

(2) Answer each next main Question on a new page.

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

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

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

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

Marks

1.   a)   **Attempt any SIX of the following:**   **12**

(i)   What are the impurities present in hard water?

(ii)   How the hardness of water can be measured? (any two)

(iii) What are primary and secondary refrigerants?

(iv) Define:

1)   Enthalpy of water

2)   Enthalpy of evaporation

(v)   What is dryness fraction? Write its formula.

(vi) Define:

1)   Specific humidity

2)   Relative humidity

(vii) What are the advantages of thermic fluid over steam? (any two)

Marks

b) **Attempt any TWO of the following:**   **8**

    (i)   What are the reactions that take place with hard water in lime soda process? (any four)

    (ii)   What is unit of refrigeration? Give its value in SI unit.

    (iii) What are the factors considered for Boiler selection?

2.   **Attempt any FOUR of the following:**   **16**

    a)   Give the comparison of hot lime soda process and cold lime soda process (any four).

    b)   What are the safe working properties of ideal refrigerants?

    c)   What are the advantages and disadvantages of water tube boiler?

    d)   Draw neat diagram of sling psychrometer and explain its working.

    e)   What are the uses of process air? (any four)

    f)   What are the impurities of water which causes corrosion in boiler? How corrosion can be prevented?

3.   **Attempt any FOUR of the following:**   **16**

    a)   What is ecofriendly refrigerant? Give one example.

    b)   Draw the neat sketch of super heater and explain its working.

    c)   Wet bulb temperature of air is 22° C and dry bulb temperature is 30° C. Find:

        (i)   Due point temperature

        (ii) Absolute humidity using psychrometric chart

    d)   With neat sketch write construction and working of forced draft cooling tower.

    e)   Explain the process of getting instrument air.

    f)   Draw the neat sketch of Cochron Boiler and label the parts.

Marks

4.   **Attempt any <u>FOUR</u> of the following:**   **16**

    a) Explain reverse osmosis process of water purification with neat sketch.

    b) Explain vapour absorption system with sketch.

    c) What are Boiler mountings? Give the uses of any two.

    d) How psychrometric chart is constructed?

    e) Write short note on Dowtherm-A.

    f) A refrigeration system operates on reverse Carnot cycle. The highest temperature of the refrigerant in the system is $35°$ C and lowest temperature is $-15°$ C. The capacity is to be 10 tonnes. Neglect all losses. Determine coefficient of performance.

5.   **Attempt any <u>FOUR</u> of the following:**   **16**

    a) With neat diagram explain vapour compression refrigeration system.

    b) Draw the sketch of bucket type steam trap. Give its use.

    c) Explain with sketch fluidized bed boiler.

    d) Define dry bulb temperature and dew point temperature.

    e) 50 kg of steam at 5 bar pressure has one kg of water in suspended form. What would be the condition of steam? Find the enthalpy of water using steam table.

    f) Give the comparison of zeolite process and ion exchange process of water softening (four points).

6.   **Attempt any TWO of the following:**   **16**

a)   With neat sketch explain construction and working of zeolite process of water softening.

b)   What are the important refrigerants used in industries? What is R-22? Give its properties.

c)   Temperature of feed water entering to the boiler is 50° C and the pressure of the steam in the boiler is 13 bar. How much heat will be required to produce 1 kg of steam if the:

(i)   Steam produced is 0.9 dry

(ii)   Dry saturated steam.

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