22311

21819

3 Hours / 70 Marks Seat No. | | | | | | | | |

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) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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

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

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

Marks

1. Attempt any FIVE of the following: **10**

a) Define temporary hardness and permanent hardness.

b) Define enthalpy of dry saturated steam.

c) List out types of steam.

d) Define refrigeration and state the unit of refrigeration.

e) Draw reversed carnot cycle of refrigeration.

f) State the principle of cooling towers.

g) State the working principle of humidifier.

Marks

2. Attempt any THREE of the following: **12**

a) Differentiate between hard water and soft water. (any four)

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

c) Explain with sketch the working of cyclone separator.

d) Compare between water tube boiler and fire tube boiler (any four).

3. Attempt any THREE of the following: **12**

a) A sample of hard water contains 1 mg $CaCl_2$ and 1 mg $MgCl_2$ per litre. Calculate the total hardness of water in terms $CaCO_3$ present in per 10^6 parts of water.

b) In ion exchange method of water treatment. After a certain period of time the ion exchange resin bed exhausts. State and explain the remedial action in this case.

c) Explain the construction and working of thermic fluid heater with a neat sketch.

d) Draw a well labeled diagram of electrostatic precipitator.

4. Attempt any THREE of the following: **12**

a) Describe the cause of caustic embrittlement. State and explain preventive measures to be taken to prevent caustic embrittlement.

b) State and explain the duties of boiler inspector.

c) State the type of Lancashire Boiler with respect to tube side passage of fluid. Draw its well labeled diagram.

d) State and explain the applications of process air in chemical industry.

e) State any two uses each of:

(i) Scrubber

(ii) Air dust collectors

Marks

5. Attempt any TWO of the following: **12**

a) With a well labeled block diagram explain the vapour absorption refrigeration cycle.

b) State types of thermic fluid and select relevant thermic fluid for given temperature range.

c) Assume that the outside air temperature is 32°C with a relative humidity ψ = 60%. Use psychrometric chart to determine

(i) The specific humidity (ω) (omega)

(ii) The enthalpy (h)

(iii) The wet-bulb temperature (Twb)

(iv) The dew point temperature (Tdp)

(v) The specific volume of dry air (v)

6. Attempt any TWO of the following: **12**

a) Represent air refrigeration cycle on PV and TS diagrams.

b) Explain the principle, construction and working of a dehumidifier. With a well labeled diagram.

c) Identify various boilers problems due to given boiler feed water, and discuss priming and foaming.