

22311

12425

03 Hours / 70 Marks

Seat No. 

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|

- 
- Instructions* –
- (1) All Questions are *Compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answer 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 Permanent and Temporary hardness.
  - b) Define Ethalpy of water.
  - c) Define wet steam and superheated steam.
  - d) Write down uses of Air (Any four).
  - e) Define dry bulb temperature and wet bulb temperature.
  - f) Define coefficient of performance refrigeration.
  - g) Enlist water softening methods. (Any four)

P.T.O.

- 2. Attempt any THREE of the following:** **12**
- a) Explain cold lime-soda batch process with diagram.
  - b) Sketch and explain the working of cyclone separator.
  - c) Explain the 'Duties of Inspector as per Indian boiler. Act 1923.'
  - d) Write down selection criteria of refrigerants. (Any four)
- 3. Attempt any THREE of the following:** **12**
- a) Write the properties of Industrial water. (Any four)
  - b) Distinguish between single stage and multistage air compressor. (Any four points)
  - c) Define: (Any two)
    - i) Sensible heating
    - ii) Sensible cooling
    - iii) Humidification
    - iv) Dehumidification.
  - d) Draw neat labelled diagram of fluidized bed boiler.
- 4. Attempt any THREE of the following:** **12**
- a) Write down uses of air dust collectors and electrostatic precipitator. (Any two uses of each)
  - b) Define thermic fluids and write down properties of thermic fluids. (Any four)
  - c) Describe Indian Boiler Act w.r.to.:
    - i) Boiler Registration
    - ii) Certificate of Renewal.
  - d) Describe vapour compression refrigeration cycle with neat labelled diagram.
  - e) Describe construction and working of cooling tower. (Any one)

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

- a) Determine the amount of heat required to generate 5 kg of steam at a pressure of 10 bar and temperature of 250°C from the water at 25°C. Take specific heat for superheated steam as 2.1 kJ/kg K.
- b) A refrigerator is working on reversed carnot cycle between the temperature of 30°C to –10°C with capacity of 10 tonnes. Find:
  - i) C.O.P.
  - ii) Heat rejected 1 hr. from the system
  - iii) Power required for the machine.

- c) Calculate the temporary and total hardness of a water sample counting.

$$\text{Mg}(\text{HCO}_3)_2 = 73 \text{ mg 1 lit}$$

$$\text{Ca}(\text{HCO}_3)_2 = 162 \text{ mg/lit}$$

$$\text{MgCl}_2 = 95 \text{ mg/lit}$$

$$\text{CaSO}_4 = 136 \text{ mg/lit}$$

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

- a) Draw neat labelled diagram of Babcock and Wilcox boiler and write its working pressure and steaming capacity.
  - b) 200 m<sup>3</sup> of air per minute at 15°C DBT and 75% relative humidity is heated until it's temperature is 25°C. Find:
    - i) Relative humidity of heated air
    - ii) Wet bulb temperature of heated air.
  - c) Describe Zeolite process for the softening of boiler feed water and write down chemical reaction for Zeolite process.
-