

22311

12425

03 Hours / 70 Marks

Seat No. 

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- 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.
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