# 22311

**21222**

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

15 minutes extra for each hour

*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.

**Marks**

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

a) Define Hard water and Soft water.

b) Define Dry steam and Wet steam.

c) List different types of Boilers.

d) State the industrial uses of compressed air.

e) State importance of wet bulb temperature in psychrometry

f) State and define unit of Refrigeration.

g) Define, Demineralized water.

**Marks**

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

a) Describe the disadvantages of Hard water.

b) Explain multistage compressing and state its advantages.

c) Describe with sketch the working of thermic fluid heater.

d) Describe vapour - compression Refrigerating cycle.

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

a) Describe with sketch Hot lime Soda process of Raw water treatment.

b) Describe the working of cyclone separator with neat labelled diagram.

c) List any four psychrometric processes and explain any one.

d) Compare water tube boiler with fire tube boiler

(Any four points)

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

a) With neat sketch describe, working of scrubber used in industry for air purification.

b) Write features of India Boiler Act? State the duties of Boiler Inspector.

c) Describe the working of Bucket trap with sketch used for Boiler steam lines.

d) State the selecting criteria for an ideal refrigerant.

e) Describe sling psychrometer with sketch.

**Marks**

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

a) A boiler produces 2500 Kg of dry saturated steam per hour at a pressure of 12 bar and the feed water is heated by an economiser to a temperature of 120°C. 240 kg of coal of C.V. of 33500 KJ/ Kg are fired per hour and it is found that 10% of the coal is unburnt. Find thermal efficiency of the boiler and of the, boiler and grate combined.

Data -

i) Sp. heat of water = 4.187 KJ/kg.k.

ii) Enthalpy of 1 kg of dry saturated steam at pressure of 12 bar, $H_S$ = 2,784.8 KJ/kg

b) A refrigerator is working on reversed carnot cycle between the temperature of 30°C to -10°C with capacity of 5 tonnes. Calculate

i) COP,

ii) Heat rejected / hr and

iii) Power required for the machine.

c) Describe Ion-Exchange, process for Demineralization of water with neat sketch and reactions.

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

a) Draw neat labelled sketch of water-tube boiler and describe its construction and working.

b) Draw neat labelled sketch of forced draft and induced draft cooling tower. Describe working of any one.

c) What is membrane technology? Describe Reverse Osmosis process for purification of water.

---