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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2023 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CH4DELA1 **Max Marks: 100**
Course: Chemical Plant Utilities **Date: 17.07.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of Steam Tables and Psychrometric Chart is permitted.

UNIT - I

1	a)	Enlist any four industrial applications of compressed air.	**04**
	b)	With the help of a neat sketch, explain the working of a single acting reciprocating compressor.	**08**
	c)	A single acting single stage compressor compressing air from 1 bar to 7 bar has a speed of 400 rpm. The cylinder diameter is 15 cm and stroke is 17.5 cm. The index of compression is 1.3. Find the power of the motor if transmission efficiency is 97% and mechanical efficiency is 90%. Neglect clearance effects.	**08**

OR

2	a)	What is a vacuum system? Explain the function of each component.	**10**
	b)	Write the classification of vacuum generators. With the help of a neat diagram, explain the working of any one vacuum generator.	**10**

UNIT - II

3	a)	Distinguish boiler mounting and accessories. Enlist the various mountings and accessories.	**05**
	b)	With the help of a neat sketch, explain the construction and working of a Locomotive Boiler.	**08**
	c)	Demonstrate the estimation of theoretical calorific values of a fuel.	**07**

UNIT - III

4	a)	With the aid of a process flow diagram and temperature-entropy diagram, explain the working of reverse Carnot cycle refrigeration system.	**10**
	b)	List any four applications of insulating materials in the chemical industry.	**04**
	c)	Elaborate on the criteria considered for the selection of insulating materials.	**06**

OR

5	a)	An Ammonia refrigerator is to produce 2 tonnes of ice per day at - 4°C from water at 20°C. If the temperature range in the compressor is between 25°C and -6°C, determine the power required to drive the compressor. Latent heat of ice= 335 kJ/Kg and specific heat of ice = 2.1 kJ/Kg.	**10**
	b)	Enlist the different types of insulation. Elucidate in detail on high vacuum insulation with the aid of a neat sketch.	**10**

UNIT – IV

6	a)	Compare and contrast forced draught and induced draught cooling towers.	**05**
	b)	With the help of a schematic diagram and the relevant equation for head developed, explain the principle and working of a natural draught cooling tower.	**10**
	c)	Illustrate any one international coloring code for piping.	**05**

UNIT - V

7	a)	Enlist the different sources of industrial water. What are the quality requisites of industrial water?	**10**
	b)	With the help of relevant equations, illustrate the ion-exchange process used for industrial water treatment.	**10**

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