

Reg. No.

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**B.E / B.TECH. DEGREE EXAMINATION, MAY 2023**

Eighth Semester

**CH18020 – PROCESS PLANT UTILITIES***(Chemical Engineering)***(Regulation 2018 / Regulation 2018A)****TIME: 3 HOURS****MAX. MARKS: 100**

- CO 1** Apply the knowledge on the various process plant utilities  
**CO 2** Discuss the concept of refrigeration, compressor and cooling towers  
**CO 3** Explain an Efficient operation is imperative for economic and safe operation is essential for the survival of industries  
**CO 4** Summarize the types of fuel used for power generation  
**CO 5** Identify the effective ways of waste disposal

**PART- A (10 x 2 = 20 Marks)**

(Answer all Questions)

	CO	RBT LEVEL
1. Mention the pre-requisites of industrial water.	1	1
2. List the pre-requisites for membranes used in reverse osmosis.	1	2
3. Show the significances of super-heated steam boilers.	3	2
4. Indicate the important functions of steam traps.	3	2
5. Name the refrigerants used in air-conditioning. List the various refrigerants.	2	1
6. Differentiate Heat pump from a Refrigerator.	2	2
7. Mention any four significances of compressors.	2	1
8. List the uses of Psychrometric chart.	4	2
9. Mention the different types of fossil fuels.	5	1
10. Differentiate between supercharger and turbocharger.	5	2

**PART- B (5 x 14 = 70 Marks)**

	Marks	CO	RBT LEVEL
11. (a) Explain in detail the effects of impure boiler feed water and the procedure for treating impure boiler feed water.	(14)	1	2
<b>(OR)</b>			
(b) Elucidate the osmosis and reverse osmosis (RO) with a neat diagram and also highlight the uses of RO.	(14)	1	2

- 12. (a)** Elucidate the operation of any one boiler used for steam production. (14) 3 2  
 (OR)  
**(b)** Highlight the different types of steam traps and mountings used in the steam Boilers. (14) 3 2
- 13. (a)** Interpret the working principle of Vapor-Compression Refrigeration with a neat diagram. Also mention the technical difficulties associated with it. (14) 2 3  
 (OR)  
**(b)** Illustrate the working principle of absorption refrigeration system with a neat sketch. (14) 2 3
- 14. (a)** Explain the working theory and performance of centrifugal compressor with suitable diagrams. (14) 4 2  
 (OR)  
**(b)** Discuss Humidification equipments with a neat diagram. (14) 4 2
- 15. (a)** Name the techniques used in incineration and explain the process of disposal in detail. (14) 5 2  
 (OR)  
**(b)** Explain the Otto engine cycle with neat sketch and derives an expression for efficiency. (14) 5 2

**PART- C (1 x 10 = 10 Marks)**

(Q.No.16 is compulsory)

- |  | Marks       | CO | RBT<br>LEVEL |
|--|-------------|----|--------------|
| <b>16.</b> A 5 tonne refrigerator plant uses RR as refrigerant. It enters the compressor at -5°C as saturated vapour. Condensation takes place at 32°C and there is no under cooling of refrigerant liquid. Assuming isentropic compression, determine COP of the plant, mass flow of refrigerant, power required to run the compressor in kw. The properties of R-12 are given table. | <b>(10)</b> | 4  | 4            |

Temp (°C)	P(bar)	Enthalpy (Kw/kg)		Entropy ((KJ/kg.k)
32	7.85	130.5	264.5	1.542
-5	2.61	-	249.3	1.557