Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2021

Subject Code: 3170516 Date:27/12/2021

Subject Name: Process Auxiliaries and utilities

Time:10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Give examples of four common utilities used in chemical plants.	**03**
	(b)	Draw the differences between a block diagram, process flow diagram and P& I diagram.	**04**
	(c)	A process for making a single product involves reacting two liquids in a continuously agitated reactor and distilling the resulting mixture. Unused reactants are recovered as overhead and are recycled. The product is obtained in sufficiently pure form as bottoms from the distillation tower. Prepare a qualitative flow sheet for the process, showing all pieces of equipments. State which types of utilities need to be used.	**07**
Q.2	**(a)**	State the characteristics of steam which makes it so popular and useful in industry.	**03**
	(b)	Enlist different types of pipe supports.	**04**
	(c)	Discuss the use of various types of pipe fittings with neat sketches.	**07**
		OR	
	(c)	State the selection criteria of valves. Enlist important types of valves and their salient features used in chemical processes.	**07**
Q.3	**(a)**	Classify piping insulation based on function and materials type.	**03**
	(b)	Give examples of low, moderate and high temperature insulation materials.	**04**
	(c)	Discuss various treatment processes for boiler fed water.	**07**
		OR	
Q.3	**(a)**	How do you calculate the schedule number of a pipe from the knowledge of working pressure and allowable stress of the MOC?	**03**
	(b)	Define steam economy. Explain how you would calculate steam economy in an evaporator.	**04**
	(c)	What is meant by ‘Condensate recovery’? Discuss the benefits of condensate recovery with special reference to its positive impact on safety and the environment.	**07**
Q.4	**(a)**	Name various types of chillers used in chemical processes.	**03**
	(b)	State the benefits of waste heat recovery.	**04**
	(c)	Enlist various commercial devices used in industry for waste heat recovery. Discuss the working of any one in brief.	**07**
		OR	
Q.4	**(a)**	State the reasons for the probable loss of steam pressure through the distribution pipeline.	**03**
	(b)	List out important accessories/auxiliary equipment for the following:	**04**

(i) Distillation column

(ii) Centrifugal pump used for transporting feed solution to a storage tank

	(c)	What are steam traps? Classify steam traps and explain the principle of any one type of steam trap.	**07**
Q.5	**(a)**	Why nitrogen is used for purging?	**03**
	(b)	What are the advantages of thermal fluid over steam as heating system?	**04**
	(c)	Explain nitrogen blanketing or padding for storage tank with a diagram. What is the effect of limiting oxygen concentration on nitrogen blanketing?	**07**

OR

Q.5	**(a)**	Define COP of a refrigerator.	**03**
	(b)	State four factors for the choice of refrigerant.	**04**
	(c)	Discuss vapor compression refrigeration cycle with diagram.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2022

Subject Code:3170516 Date:06/06/2022

Subject Name:Process Auxiliaries and utilities

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Give your thoughts about pipe material, pipe size and pipe fitting in relation with the industries.	**03**
	(b)	What is the roll of pipe drawing, pipe installation and pipe insulation in piping design?	**04**
	(c)	Draw any chemical engineering process flow diagram and explain.	**07**
Q.2	**(a)**	Write down about different types of valve along with its figure.	**03**
	(b)	What are the selection criterions of valves for various systems?	**04**
	(c)	Explain type of pumps along with its advantages and disadvantages.	**07**
		OR	
	(c)	Briefly explain below terms 1) NPSH requirement 2) Pump location 3) Pump piping 4) Pump piping support	**07**
Q.3	**(a)**	What is Reverse Osmosis and how does it work?	**03**
	(b)	Demineralization : An overview	**04**
	(c)	With respect to drawing air through the tower, explain types of cooling towers.	**07**
		OR	
Q.3	**(a)**	How you can define waste water? Explain the treatment procedure of water waste?	**03**
	(b)	Give your understanding about performance characteristics of vacuum pumps.	**04**
	(c)	Short note :Process heating systems using steam	**07**
Q.4	**(a)**	An overview: Air Compressors & Air Dryers	**03**
	(b)	Different types of ejectors. Briefly explain	**04**
	(c)	Short note : Non-steam heating system	**07**
		OR	
Q.4	**(a)**	Point out the application compressors.	**03**
	(b)	Give your understanding about pressure rating in pipes.	**04**
	(c)	Write down applications of valves.	**07**
Q.5	**(a)**	Point out the application vacuum pumps.	**03**
	(b)	List out characteristics of typical domestic wastewater.	**04**
	(c)	Write down the principles of basic refrigeration. What is a chiller?	**07**

OR

Q.5	**(a)**	How to calculate pipe schedule?	**03**
	(b)	What are the applications of a boiler?	**04**
	(c)	Application of refrigeration. Write down	**07**

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