Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3170515 Date:16-12-2023

Subject Name:Piping Design

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.**

			Marks
Q.1	**(a)**	State advantages and disadvantages of orifice meter.	**03**
	(b)	List the basic mechanical properties which a material should possess and explain any three of them?	**04**
	(c)	Explain mechanical properties of piping material and their selection criteria.	**07**
Q.2	**(a)**	Estimate the optimum pipe diameter for a flow of dry chlorine gas of 20,000 kg/hr at 3 atm a and 25^{o}C through carbon steel pipe.	**03**
	(b)	Write brief note on NPSH for centrifugal pump.	**04**
	(c)	Hexane at 37.8^{o}C is pumped through the system at a rate of 9.09m^{3}/h. The tank is at atmospheric pressure. Pressure at the end of discharge line is 345 kPa g. The discharge head is 3.05 m and the suction lift is 1.22 m above the level of liquid in the tank. The friction loss in suction line is 3.45 kPa and that in the discharge line is 37.9 kPa. The mechanical efficiency of the pump is 0.6. The density of hexane is 659kg/m^{3} and its vapour pressure at 37.8^{o}C is 33.71 kPa. Calculate (a) $(NPSH)_A$ and (b) power required by centrifugal pump.	**07**
		OR	
	(c)	Carbon dioxide is to be conveyed from the top of the stripper of ammonia plant to urea plant. Calculate the total pressure drop in pipe line based on following data. Flow rate of CO_2 = 1000 t/day Total length of pipe = 800 m Available pressure at inlet of pipe = 24kPa g Discharge pressure of CO_2 from pipe required = atmospheric No. of 90^{o} elbows in pipe line = 8 No. of butterfly valve = 1 No. of flow nozzle = 1 Temperature of gas = 60^{o}C Viscosity of CO_2 gas = 0.016 mPa or cP Velocity of gas through pipe = 20 m/s Equivalent velocity head for 90^{o} elbows = 0.75 Equivalent velocity head for butterfly valve = 0.24 Pressure drop in the flow nozzle is negligible.	**07**
Q.3	**(a)**	What is water hammer?	**03**
	(b)	Draw and write about different types of flange facings.	**04**
	(c)	Write brief note on gate valve and its applications in the industry.	**07**
		OR	
Q.3	**(a)**	Explain steam separators and steam traps.	**03**
	(b)	Discuss the various types gaskets and their selection criteria.	**04**
	(c)	Write brief note on globe valve and its applications in the industry.	**07**

Q.4	**(a)**	What is operating pressure and operating temperature for piping system?	**03**
	(b)	List out the steps for finding thickness steel pipe using external pressure.	**04**
	(c)	What is longitudinal and hoop stress. Derive relation between hoop stress & longitudinal stress.	**07**

OR

Q.4	**(a)**	What is design pressure and operating temperature for piping system?	**03**
	(b)	List out the steps for finding thickness steel pipe using internal pressure.	**04**
	(c)	Derive equation for thickness required by jacketed steel pipe using external pressure.	**07**
Q.5	**(a)**	Explain about different types of expansion joints and their applications.	**03**
	(b)	Explain various pipe supports and selection criteria.	**04**
	(c)	Draw P and I diagram for distillation column and pump with explanation	**07**

OR

Q.5	**(a)**	Discuss the types of loads.	**03**
	(b)	Differentiate between PFD and P&ID.	**04**
	(c)	Draw P and I diagram for Reactors and Shell and tube heat exchanger with explanation	**07**

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