Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E SEM-VII Examination-Nov/Dec.-2011

Subject code: 170403 **Date: 24/11/2011**

Subject Name: Bioprocess Plant Design

Time: 10.30 am-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.**

Q.1 **14**

Design a reactor for the following three options:
Reactor with plain jacket, Reactor with channel jacket and Reactor with half coil jacket.

Data: Inside diameter of shell = 1180mm, Inside diameter of jacket = 1240 mm , Shell length = 12 cm, Diameter of half coil = 6cm,Width of channel jacket = 5.8 cm, Internal design pressure for shell = 4 kgf/cm^2,Internal design pressure for jacket = 2kg/cm^2,MOC for both shell and jacket is same. Max. allowable stress for MOC = 980 kgf/cm2,Modulus of elasticity ,E, fro MOC = $19x10^5$ kgf/cm^2,Poisson's ratio, μ = 0.3,J = 0.85,Corrosion allowance = 2mm.

Q.2 **(a)** Write about features of storage tanks in brief with figure. **07**

(b) What are the types of support? Discuss. **07**

OR

(b) Briefly explain the types of stress on any equipment. **07**

Q.3 **(a)** Give the importance of designing with major considerations for various equipments. **07**

(b) Write stepwise procedure for mechanical design of tall vertical vessels. **07**

OR

Q.3 **(a)** Explain the terms: Corrosion allowance, Stress, Bioreactor, Head and Closure, Schedule Number, power requirement of pipe. **07**

(b) A sperical vessel is to be designed for the max. Operating pressure of 2.8 kgf/cm^2. The vessel has the 1190 mm outside diameter. The vessel is made of stainless steel having allowable stress value of 12.858 kgf/mm^2. What will be the standard plate thickness required to fabricate this vessel ? If a cylindrical vessel having the same outside diameter and thickness is fabricated with same MOC, what max-internal pressure the cylinder will withstand safely? Also comment on the results obtained. Joint efficiency factor, J=0.85 **07**

Q.4 **(a)** Elaborate on concept of multiple effects in evaporators. **07**

	(b)	Give the applications of different valves in Biotech Industries.	**07**

OR

Q.4	**(a)**	What are the types of pumps? Give its applications for Biotech industries.	**07**
	(b)	How piping systems are designed?	**07**
Q.5	**(a)**	Write a Brief note on : Process Design of Distillation tower	**07**
	(b)	Discuss Process Flow Diagrams.	**07**

OR

Q.5	**(a)**	Enlist various factors affecting allocation of Fluid in Shell and Tube Heat Exchanger.	**07**
	(b)	What are the major points to be considered while discussing Bioprocess economics for plants?	**07**

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