Seat No.:		o.: Enrolment No	Enrolment No	
		GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2017		
S	Subje	ct Code: 2161401 Date: 27/04/	Date: 27/04/2017	
S	Subje	ct Name: Food Process Equipment Design		
]	Fime:	10:30 AM to 01:00 PMTotal Mark	(s: 70	
Ι	nstruc	Attempt all questions		
	1. 2.	Make suitable assumptions wherever necessary.		
	3.	Figures to the right indicate full marks.		
	4.	Use of steam table is permitted		
0.1		Short Questions	14	
	1	Explain term THE for Dryers?		
	2	What is design pressure in pressure vessels?		
	3	What is corrosion allowance?		
	4	What do understand about joint checking efficiency?		
	5	Explain Regeneration?		
	6	What is the difference between forward and backward feed?		
	7	What is the difference between dryer and evaporator?		
	8	Why bursting of pickle can take place?		
	9	What is the difference between thin and thick wall pressure vessel		
	10	Where helical screw agitators are used in food industry?		
	11	Explain NTU?		
	12	What is relationship between agitator Power number and Reynolds number?		
	13	How effectiveness of heat exchanger is evaluated?		
	14	Which type of pressure vessel head is commonly used in food industry and Why?		
Q.2	(a)	Compare Counter flow and Parallel flow for a heat exchanger?	03	
	(b)	Explain the working of falling film and rising film evaporator?	04	
	(c)	A pressure vessel is designed considering safe permissible stress as 44 N/mm^2 at 62° C. If the joint efficiency and joint checking efficiency are 70% and 80% respectively and the material has allowable stress at 26 and 156°C as 260 and 195 N/mm ² respectively. Find the safety factor for the design of pressure vessel.	07	
	(-)	OR	07	
	(C)	A tray aryer is used to ary spinach from 2000% to 5% moisture content (dry basis) with hot air of 70°C. Ambient air (26°C) is heated by an electric heater and forced in the drying chamber through blower. If the air leaving the drying chamber has temperature of 48°C. The wet bulb temperature of the ambient	U7	

air, heated air and air coming out of the dryer are18, 32 and 32°C respectively. Calculate the performance of the dryer? Suggest methods for improving the same?

Q.3	(a) (b)	Discuss the significance of power number of an agitator. What are the factors considered for the selection of an agitator?	03 04
	(b) (c)	Explain the U- arrangement: Z- arrangement and $2x4/1x8$ arrangements in	07
		plate heat exchanger with diagram?	-
		OR	
Q.3	(a)	Discuss different type of turbine blades used and their limitations?	03
	(b)	With neat sketch explain working of a turbine type agitator?	04
	(c)	Discuss the significance of LMTD and limits of different parameters for better performance of plate heat exchanger?	07
0.4	(a)	Differentiate between Condensation and Crystallization.	03
X	(b)	Discuss what are the reasons for failure of well design pressure vessel?	04
	(c)	Design a solid agitator shaft for the process of agitation if maximum bending	07
		moment and maximum torque developed in the process are 280 and 165 N m	
		respectively. The material of the shaft have safe permissible tensile stress at	
		the operating condition is 500 N/cm ² and shear stress is 60% of the tensile	
		stress.	
		OR	
Q.4	(a)	How the performance of the dryer can be improved?	03
	(b)	Discuss what are the reasons for failure of well design agitator?	04
	(c)	Design a pressure vessel to sterilize the 4.5 KL liquid food of specific	07
		gravity 1.05 at 0.18 N/mm ² and 58°C. The safe permissible stress at	
		operating temperature, considering all efficiency and safety factor is 36	
		N/mm^2 . Sheets available in the stock are: Length any size.	
		Width: 1000, 1250, 1800 and 2200 mm and	
		Thickness: 5.5, 6.0 and 7.0 mm	
		$V = \pi R^2 H; t_v = p D / \{2f - p\}; t_h = \{p R W\} / 2f;$	
0 5	(\cdot)	$W = 0.25 \left[3 + \left\{ K_i / K_c \right\}^{0.05} \right]$	03
Q.5	(a) (b)	why barring is done in an agitator?	03
	(D)	Discuss possible process nazards in any food processing industry?	04
	(C)	applications in food industry?	07
		OR	
Q.5	(a)	What are the limitations of baffling in an agitator?	03
-	(b)	What are the material hazards possible in any food processing industry?	04
	(c)	Write down the steps of designing LSU dryer?	07
