

## Model Question Paper -1 with effect from 2020-21(CBCS Scheme)

USN

--	--	--	--	--	--	--	--	--	--

### Fifth Semester B.E. Degree Examination CHEMICAL EQUIPMENT DESIGN

TIME: 03 Hours

Max. Marks: 100

- Note:
1. Answer any FIVE full questions, choosing at least ONE question from each MODULE.
  2. Use of IS code 2825-1969, Perry's Chemical Engineer's hand book permitted
  3. Missing data maybe suitably assumed.

Module – 1			
<b>Q.1</b>	<b>(a)</b>	Discuss the various factors to be considered for satisfactory design of process equipment.	08
	<b>(b)</b>	Explain the different types of static and dynamic stresses.	12
<b>OR</b>			
<b>Q.2</b>	<b>(a)</b>	An evaporating drum 1.5 m I.D., 2 m height is operating at a pressure of 100 mmHg, the outside pressure is atmosphere. Operating temperature is 1300C, material is IS 2002-1962 2A. Design the shell where $E = 19 \times 10^{10} \text{ N/m}^2$ head and $\mu = 0.3$	14
	<b>(b)</b>	Write a note on stiffening ring with neat diagram	06
<b>Module – 2</b>			
<b>Q.3</b>	<b>(a)</b>	Explain different types of supports with neat sketches.	08
	<b>(b)</b>	Write a note on heads or closures and flanges with neat diagram	12
<b>OR</b>			
<b>Q.4</b>	<b>(a)</b>	Write a short note on Nozzle and Gaskets	08
	<b>(b)</b>	Estimate the thickness of, the (100-10) dished head, (2:1) elliptical head and conical head with 1000 apex angle for a cylindrical shell of 1.5 m I.D., 2 m height operating at 14 bar and 2500C. Material : IS 2002-1962 Grade 2A, f at design temperature $88.29 \times 10^6$ and C A is 1.5mm.	12
<b>Module – 3</b>			
<b>Q.5</b>	<b>(a)</b>	How storage vessels are classified? Explain	10
	<b>(b)</b>	List out the different losses in storage vessel and explain briefly	10
<b>OR</b>			
<b>Q.6</b>	<b>(a)</b>	Explain different types of roofs used for storage vessel with neat sketches.	10
	<b>(b)</b>	A cylindrical storage vessel of 2.5 m ID, 6m height is to be made from readily available standard type of rectangular plates of 2m X 2.5m Xsize. Determine i) Bottom cover plate thickness ii) Thickness of shell plates	10

<b>Module – 4</b>			
<b>Q.7</b>	<b>(a)</b>	Explain the concept of mixing and agitation and show the sketches of different mix impellers.	10
	<b>(b)</b>	List out different types of jackets used for reaction vessel and explain any three briefly	10
<b>OR</b>			
<b>Q.8</b>	<b>(a)</b>	A turbine agitator with six blades is installed centrally in a vertical tank. The tank is 1.83 m in diameter; turbine is 0.61 m in diameter and is positioned at 0.61 m from the bottom of the tank. Based on the given following data, calculate: a) Power required for the agitation. b) Shaft diameter. Height of the liquid is 1.83 m, viscosity of fluid 15 CP, density of liquid 1500 kg/m <sup>3</sup> , speed of agitator $n = 90$ rpm, length of agitator shaft b/n bearing and agitator 2.1 m, width of the blade 120 mm, number of baffles at tank wall is 4, ultimate tensile stress 4200 kgf/cm <sup>2</sup> , maximum allowable shear stress in shaft 550 kgf/cm <sup>2</sup> , $E = 19.5 \times 10^5$ kgf/cm <sup>2</sup> , Take Power Number = 6.	14
	<b>(b)</b>	Discuss the types of supports provided for reaction vessels with neat diagram.	06
<b>Module – 5</b>			
<b>Q.9</b>	<b>(a)</b>	What are the different types of stresses acting on tall vertical vessel? Explain step by step procedure for tall vertical vessel.	10
	<b>(b)</b>	Explain how pressure drop across a given pipeline is determined. Explain with neat sketch	10
<b>OR</b>			
<b>Q.10</b>	<b>(a)</b>	Write a short notes on P and I Diagram and pipe coloring code	10
	<b>(b)</b>	Explain condensate and steam pipe design briefly	10

Table showing Bloom's Taxonomy Level, Course Outcome, and Programme Outcome				
Question		Bloom's Taxonomy Level attached	Course Outcome	Program Outcome
Q.1	(a)	L2	CO1	1,7
	(b)	L2, L3	CO1	1,2,6,7
Q.2	(a)	L3	CO1	1,7
	(b)	L2	CO1	1,7
Q.3	(a)	L2	CO2	1,7
	(b)	L2	CO2	1,7
Q.4	(a)	L2	CO2	1, 7
	(b)	L3	CO2	1, 7
Q.5	(a)	L2	CO3	1,7
	(b)	L2	CO3	1,7
Q.6	(a)	L2	CO3	1,7
	(b)	L2,L3	CO3	1,2,6,7
Q.7	(a)	L1, L2,	CO4	1,2,7
	(b)	L2	CO4	1,2,6,7
Q.8	(a)	L2, L3	CO4	1,2,6,7
	(b)	L1, L2	CO4	1, 7
Q.9	(a)	L1, L2	CO5	1,7
	(b)	L1, L2	CO5	1,7
Q.10	(a)	L2, L3	CO5	1,2, 6,7
	(b)	L1, L2	CO5	1,7
Bloom's Taxonomy Levels	<b>Lower order thinking skills</b>			
	Remembering( knowledge): <i>L</i> <sub>1</sub>	Understanding Comprehension): <i>L</i> <sub>2</sub>	Applying (Application): <i>L</i> <sub>3</sub>	
	<b>Higher-order thinking skills</b>			
	Analyzing (Analysis): <i>L</i> <sub>4</sub>	Valuating (Evaluation): <i>L</i> <sub>5</sub>	Creating (Synthesis): <i>L</i> <sub>6</sub>	

