Enrolment No.\_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-VII EXAMINATION – WINTER 2015

Subject Code: 170502 Date: 07/12/2			15
Subj Time Instru	ect 1 e: 10 iction	(anne: Process Equipment Design-II) 30am to 1:30pm Total Marks: 70	
	1. 2. 3.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.	
Q.1		Discuss the following: (i) internal design pressure (ii) external design pressure (iii) design temperature (iv) Classification of equipment as per IS-2825 (v) Corrosion Allowance (vi) Welding joint efficiency factor (vii) Radiography.	14
Q.2	<b>(a)</b>	Discuss the design of torispherical head for internal and external	07
	(b)	Discuss the different types of standard flanges with a neat sketch. OR	07
	(b)	Discuss the design of bracket or lug support.	07
Q.3		A storage tank for benzene having following data: Tank diameter : 6.0 m Tank height : 8.5 m Sp. Gr. Of liquid: 0.88 Conical roof slope – permissible 1 in 5 Superimposed load - 125 kg/m <sup>2</sup> Material – carbon steel (structural) Permissible stress : 980 kgf/cm <sup>2</sup> Density of plate material : 7800 kg/m <sup>3</sup> Modulus of elasticity: 2 x 10 <sup>6</sup> kg/cm <sup>2</sup> Standard plate size = 1 m x 1 m Design the shell and bottom. Find out the thickness of self- supporting conical roof. <b>OR</b>	14
Q.3		Discuss the various steps used for design of column supported conical roof.	14
Q.4	(a) (b)	Discuss with a neat sketch various types of jackets. Discuss the method of design for loose flange for reaction vessel.	07 07
Q.4		The shell & tube heat exchanger has the following data: Shell inside diameter : 500 mm Tube o.d. = 15.875 mm Thickness of tube = 1.65 mm Internal operating pressure of shell side = $3.0 \text{ kgf/cm}^2$ Internal operating pressure of tube side = $6.0 \text{ kgf/cm}^2$ Allowable stress for shell and tube material = $1054 \text{ kgf/cm}^2$ Material of shell : SA 312 TP 304 (seamless pipe) Material of tube : SS 304 Density of SS 304 = $8000 \text{ kg/m}^3$	14

	Mean diameter of gasket = 550 mm No. of pass on tube side = 2 Depth of pass partition plate = 5 mm Calculate: (1) thickness of shell (2) thickness of tube (3) thickness of torispherical heads (4) blank diameter and weight of heads (5) thickness of tube sheet. Use only internal design pressure. Neglect the thickness calculation by external design pressure.	
Q.5	<ul> <li>Write Short notes: (any two)</li> <li>1. Agitators</li> <li>2. Skirt support</li> <li>3. TEMA Designations</li> </ul>	14
Q.5	A distillation column has following data: Shell outer diameter at top = 1800 mm Shell length tangent line to tangent line = 20 meter Internal design pressure = 4 kgf/cm <sup>2</sup> Design temperature = 120 °C Shell material = SA 283 Gr C Joint efficiency = 85% Skirt height = 4 m Tray spacing = 0.3 m (58 trays) Top disengagement space = 1.2 m Weight of liquid and tray = 120 kg/m <sup>2</sup> Weight of attachment(pipes, ladders & platform) = 150 kg/m Wind pressure = 130 kg/m <sup>2</sup> Insulation thickness = 100 mm Density of insulation = 500 kg/m <sup>3</sup> Allowable stress = 890 kgf/cm <sup>2</sup> Modulus of elasticity = 2 x 10 <sup>6</sup> kgf/cm <sup>2</sup> Poisson's ratio = 0.3 Corrosion allowance = 2 mm Sp. Gr. of shell material = 7.865 Neglect the stress created by eccentric load and seismic load. Calculate the thickness of shell plate for entire tower.	14

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