

**B.TECH. SEM -VI (CHEMICAL 2014 COURSE (CBCS) :  
WINTER - 2017**

**SUBJECT: CHEMICAL PROCESS EQUIPMENT DESIGN-I**

Day : **Tuesday**  
Date : **21/11/2017**

**W-2017-2174**

Time : **10.00 AM TO 01.00 PM**  
Max Mark: 60

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data, if necessary.

**Q.1** a) What are materials of construction for process equipment's? Explain in detail. (06)

b) Define :- i) Corrosion ii) Poisson's Ratio (04)

**OR**

Explain in detail general design procedure. (10)

**Q.2** a) Derive an expression for volume of vessel regarding optimum vessel size. (07)

b) Define conical head and give its formula for the calculation of thickness, head and area of compression ring. (03)

**OR**

What are different roofs of tank? Explain floating roof in detail with diagram. (10)

**Q.3** a) Explain design of support use for vessels. (07)

b) What are general rules followed while selecting anchor bolts? (03)

**OR**

A tall vertical vessel 1.5 m in diameter and 13 m in height is to be provided (10)

skirt support. Weight of vessel with all its attachments is 80,000 kg.

Diameter of skirt is equal to diameter of the vessel. Height of skirt is 2.2 m.

Wind pressure acting over the vessel is 100 Kg/m<sup>2</sup>

$K_1 = 0.7$  for cylindrical vessel.

$C = 0.08$  seismic coefficients.

Permissible tensile stress of skirt material = 960 kg/cm<sup>2</sup>. Permissible

compressive stress is 1/3 of yield stress of material. Yield stress of material

= 2400 kg/cm<sup>2</sup>. Estimate the thickness of skirt support.

**Q.4** a) The area of heat transfer is 10 square meters. The aniline flow rate is 4500 (07)

kg/hr, Toluene at 37°C flowing at a rate of 3900 kg/hr, counter current flow.

The average specific heat of aniline is 2.1 and that of toluene is 1.85 KJ/kgK.

If the flow is counter current, calculate the LMTD and the overall heat

transfer coefficient. If the dirt factor is 0.0003 m<sup>2</sup>k/w, find the clean

coefficient.

b) Give classification of heat exchangers. (03)

**OR**

a) Discuss the factors of be considered when a design engineer selects double (05)

pipe exchangers.

b) Write short note on types of baffles used in shell and tube heat exchangers (05)

with figures.

**Q.5** a) Explain anchor agitator with diagram. (05)

b) Explain turbine agitator with diagram. (05)

**OR**

a) What are agitators? Explain their uses. (05)

b) Explain helical- ribbon agitator with diagram. (05)

**Q.6** Explain with diagram:- (10)

a) Electrostatic precipitator b) Gravity thickener

**OR**

Explain with diagrams:- (10)

a) Cyclone separator b) Decanter