

B.Tech. SEM -VI (Chemical 2014 Course (CBCS) : SUMMER - 2019
SUBJECT: CHEMICAL PROCESS EQUIPMENT DESIGN – I

Day: Friday
Date: 24/05/2019

S-2019-2706

Time: 02.30 PM TO 05.30 PM
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non programmable calculator is **ALLOWED**.
- 4) Assume suitable data, if necessary.

Q.1 a) Explain the theories of failure. **(05)**

b) Elaborate in detail various mechanical properties of material. **(05)**

OR

Explain general design procedure. **(10)**

Q.2 a) Explain the Torispherical head design. **(05)**

b) What are the general considerations in pressure vessel. **(05)**

OR

Derive the equation for designing of thin walled vessel under internal pressure. **(10)**

Q.3 Explain various types of supports in detail. **(10)**

OR

a) Explain criteria for selection of supports. **(05)**

b) Explain various stress induced in supports. **(05)**

Q.4 Design an exchanger to sub cool condensate from a methanol condenser from 95⁰C to 40⁰C flow rate of methanol is 100000 kg/h. Brackish water will be used as a coolant with a temperature rise from 25⁰C to 40⁰C. (Consider only thermal design) Shell bundle clearance is 68 mm. **(10)**

OR

a) Explain general design procedure for shell and tube heat exchanger. **(05)**

b) Explain Kern's method. **(05)**

Q.5 Derive the equation for power consumption by agitator. **(10)**

OR

Explain various agitators used in chemical process industry. **(10)**

Q.6 Estimate the sedimentation rate in gravity separation and centrifugal separation for the limiting particle size $d_{lim} = 8 \mu m$
Particle density = 1050 kg/m³
Liquid density = 1000 kg/m³
Viscosity of continuous phase = 1.0×10^{-3} N-S/m² **(10)**

OR

a) Explain general design procedure for decanter. **(05)**

b) Explain evaporator design. **(05)**

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