

**B.Tech. SEM -VII (Chemical 2014 Course (CBCS) : WINTER - 2018**

**SUBJECT: MULTIPHASE REACTION ENGINEERING**

Day : Monday  
Date : 03/12/2018

**W-2018-2524**

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) Draw a neat and labeled diagram **WHENEVER** necessary.
- 4) Assume suitable data if necessary.

**Q.1** Differentiate between mechanically agitated contactor (MAC) and bubble column (BC) with an industrial example **(10)**

**OR**

**Q.1** Classify impellers. Enumerate turbines with reference to flow pattern generated in MAC. **(10)**

**Q.2** Derive following expression for liquid phase chemical reaction equilibrium: **(10)**

$$K = \left[ \prod_i (x_i \gamma_i)^{v_i} \right] \exp \left[ \frac{(P - P^0)}{RT} \sum_i v_i V_i \right]$$

**OR**

**Q.2** Derive following expression, correlating chemical reaction equilibrium constant with temperature: **(10)**

$$\ln \frac{K}{K_1} = \frac{-\Delta H^0}{R} \left( \frac{1}{T} - \frac{1}{T_1} \right)$$

**Q.3** Write a note on following with reference to MAC: **(10)**

- (i) Power consumption in the presence of gas
- (ii) Solid suspension

**OR**

**Q.3** Enumerate experimental methods to determine solid phase hold- up in solid liquid fluidized bed (SLFB). **(10)**

**Q.4** State the assumptions made to derive axial dispersion plug flow model. Also derive following expression for SLFB: **(10)**

$$\frac{\partial C}{\partial t} = D_L \frac{\partial^2 C}{\partial z^2} - \frac{V_L}{\epsilon_L} \frac{\partial C}{\partial z}$$

**OR**

**Q.4** Enumerate the effect of physical properties of solid phase on liquid phase dispersion coefficient using any one empirical correlation. **(10)**

**(P.T.O)**

**Q.5** Enumerate the effect of: (i) impeller type and diameter, and (ii) liquid density and viscosity on heat transfer coefficient in MAC. **(10)**

**OR**

**Q.5** Enumerate solid dissolution method to determine mass transfer coefficient in multiphase reactor with relevant mathematical expression. **(10)**

**Q.6** Derive an expression to estimate pressure drop in fluidized bed. **(10)**

**OR**

**Q.6** Enumerate any two empirical equations to determine mass transfer coefficient in SLFB. What is the physical significance of Reynolds number **(10)**

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