

M. Tech. –I (Chemical Engineering) (CBCS – 2015 Course) :

WINTER - 2018

SUBJECT: MULTIPHASE REACTORS

Day: Monday
Date: 10/12/2018

W-2018-3131

Time: 11.00 AM TO 02.00 PM
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
 - 2) Figures to the right indicate **FULL** marks.
 - 3) Answers to both the sections should be written in the **SEPARATE** answer books.
 - 4) Use of non-programmable **CALCULATOR** is allowed.
 - 5) Draw neat and labeled diagram **WHEREVER** necessary.
 - 6) Assume suitable data if necessary.
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SECTION-I

Q.1 Classify multiphase reactors. Enumerate any one with reference to its industrial application. **(10)**

OR

A gas- liquid reaction is to be carried out, which contactor would you select? **(10)**
Give reasons.

Q.2 Derive following expression, relating Gibbs free energy change (ΔG^0) to chemical reaction equilibrium constant (K): **(10)**

$$\Delta G^0 = -RT \ln K$$

OR

What is chemical reaction equilibrium constant (K)? What is the effect of pressure and temperature on K. **(10)**

Q.3 Derive an expression to estimate power consumption by an impeller in mechanically agitated contactor (MAC). **(10)**

OR

What is a criterion of solid suspension in MAC? What is the effect of physical properties of solid phase on critical impeller speed for solid suspension? **(10)**

SECTION-II

Q.4 Differentiate between axial dispersion plug flow model and tank in series model. Which model would be suitable to estimate liquid mixing in solid liquid fluidized bed (SLFB)? **(10)**

OR

What is E(t) and F(t)? Derive a relationship between E(t) and F(t). **(10)**

Q.5 What is the effect of system and operating parameters on heat transfer coefficient? Enumerate with reference to heat exchanger. **(10)**

OR

Enumerate solid dissolution method of estimation of mass transfer coefficient? What are its limitations? **(10)**

Q.6 Derive an expression to estimate pressure drop in SLFB in laminar regime. **(10)**

OR

Enumerate the steps involved in design of multiphase reactors. Detail any one step. **(10)**

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