Roll No. | | | | | | | | | | | | |  Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (BT) (2012 to 2017) (Sem.–5)

# CHEMICAL ENGINEERING PRINCIPLES

Subject Code : BTBT-501

M.Code : 70502

Time : 3 Hrs. Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

## SECTION-A

**Answer briefly :**

1. Express a pressure of 20 x $10^3$ Pa in mm Hg.
2. Define Raoult's law.
3. What is Molecularity of the reaction?
4. A reaction has a stoichiometric equation A + B → 2R, state the order of the reaction.
5. Define space time.
6. Write the uses of following measurement :

   a) pH b) Viscosity
7. State two disadvantages of continuous reactors.
8. What are the advantages of cascade control?
9. What is the ideal batch reactor?
10. Differentiate closed loop and open loop control.

## SECTION-B

11. A reaction was carried out in a batch reactor and the results are reported below. Calculate the rate of the reaction.

| **Time, t (min)** | 0 | 10.0 | 30.0 |
|---|---|---|---|
| **% Conversion** | 19.8 | 46.7 | 74.0 |

12. List various advantages and disadvantages of :

    a) Feed forward control system and

    b) Feed Backward control system.

13. A plug flow reactor (2000 litre) processes an aqueous feed (100 litre per min) containing reactant A ($C_{A0}$ = 100 millimol/litre). This reaction is reversible and represented by

$$A \rightleftharpoons R, -r_A = \left(0.04 min^{-1}\right) C_A - \left(0.01 min^{-1}\right) C_R$$

    Find the equilibrium conversion and the actual conversion of A in the reactor.

14. What are the factors affecting dynamic response of mercury thermometer?

15. What is calibration? State the methods for calibrating the measuring instrument.



## SECTION-C

16. Reactant A(A → R, $C_{AO}$ = 26 $mol/m^3$), passes in steady flow through four equally size mixed flow reactors in series $\left(\tau_{total} = 2 min\right)$. When steady state is achieved the concentration of A is found to be 11, 5,2,1 $mol/m^3$ in the four units, For this reaction, what must be $\tau_{plug}$ so as to reduce CA from $C_{AO}$ = 26 to $C_{Af}$ = 1 $mol/m^3$?

17. Define Semi-batch reactors. And state the advantages and disadvantages of batch reactor.

18. What are the desirable and undesirable properties of an instrument? How these properties help in choosing the right instrument for a particular measurement?

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**