



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN  
 [AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]  
 Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

**Question Paper Code: 90023**

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026  
 Sixth Semester  
 Biotechnology  
 U19BT622 – CHEMICAL REACTION ENGINEERING  
 (Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

**PART – A**

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define the term Chemical Kinetics.	2	K1	CO1
2.	State zero order reaction with an example.	2	K1	CO1
3.	Compare the CSTR with Batch reactors.	2	K2	CO2
4.	List any two applications of Batch reactor.	2	K1	CO2
5.	Sketch the schematic representation of Plug flow reactor.	2	K2	CO3
6.	Compare MFR and PFR.	2	K3	CO3
7.	What do you mean by series reactions and give examples?	2	K1	CO4
8.	Define the term selectivity.	2	K1	CO4
9.	Recall the term Residence time distribution and give its importance.	2	K1	CO5
10.	Classify Ideal and non-Ideal flow.	2	K3	CO5

**PART – B**

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Write a detailed note on classification of chemical reactions.	13	K2	CO1

(OR)

- b) A rocket engine burns a stoichiometric mixture of fuel (liquid hydrogen) in oxidant (liquid oxygen). The combustion chamber is cylindrical, 80 cm long 65 cm in diameter and combustion process produces 108kg/sec of exhaust gases. If combustion is complete. Find the rate of reaction of hydrogen and rate of reaction of oxygen. 13 K2 CO1
12. a) Illustrate the performance equation of isothermal batch reactor with its graphical representation. List any two advantages, disadvantages and applications. 13 K2 CO2

(OR)

- b) Tetrahydrophthalic anhydride is produced by bubbling butadiene in molten Maleic anhydride at 110°C. The concentration of Maleic anhydride fed to the CSTR is 4.5 gmmole/lit. The solubility of butadiene in Maleic anhydride at 110°C is  $1.67 \times 10^{-4}$  gm mole/cm<sup>3</sup>. The second order reaction rate constant is 13.2 cm<sup>3</sup>/ gm mole-sec. The reaction mixture is maintained at uniform conditions by turbine agitator revolving at 850 rpm. The molal flow rate of the Maleic anhydride reactant to CSTR is 0.3 gm mole/sec. Calculate the volume of CSTR required to achieve 98% conversion. 13 K2 CO2
13. a) Construct a suitable design equation for steady state Mixed flow reactor (MFR) with neat schematic and graphical representation. 13 K3 CO3

(OR)

- b) An aqueous reactant stream (4 moles A/lit) passes through a Mixed flow reactor followed by a plug flow reactor. Find the concentration at the exit of the plug flow reactor if in the Mixed flow reactor  $C_A=1$  mol/lit. The reaction is second order with respect to A. The volume of the Plug flow reactor is three times that of the Mixed flow reactor/CSTR. 13 K3 CO3
14. a) Explain in detail about irreversible series-parallel reactions with examples. 13 K3 CO4

(OR)

- b) Outline the quantitative treatment of product distribution in MFR and PFR and discuss about instantaneous fractional yield. 13 K3 CO4
15. a) With neat sketch explain the RTD measurement by pulse input method and transformation of E curve from C curve. 13 K3 CO5

(OR)

- b) Develop an equation RTD in Plug Flow Reactor and Mixed Flow Reactor with response to a pulse tracer input. 13 K3 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	Develop the design equation of Constant stirred tank reactor (CSTR) with neat graphical representation.	15	K3	CO2
(OR)				
b)	Identify the contacting patterns in non-continuous and continuous flow operations for various combination of high and low concentrations of the reactants with neat sketch.	15	K3	CO4