[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper	:	**1797**	**L**
Unique Paper Code	:	6092011201	
Name of the Paper	:	Chemistry and Engineering of Polymer Reactions	
Name of the Course	:	**B.Sc. (H) Polymer Science**	
Semester	:	II	

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No- on the top immediately on receipt of this question paper.
2. Draw a neat and labelled diagram wherever necessary.
3. Attempt five questions in all. Question No. 1 is compulsory.
4. Use of a calculator is allowed, and a log table may be provided.

Q1.

i. Why is no initiator required in plasma polymerization?
ii. What is redox initiation? Explain
iii. Reactor is called as heart of polymerization process. Explain
iv. Define kinetic chain length.
v. Give schematic representation of batch and semi-batch reactor
vi. Explain why bulk polymerization is generally more suited for step-growth polymerization than for chain-growth polymerization.
vii. Illustrate retardation on chain growth polymerization with suitable example
viii. How would you achieve crosslinking in step growth polymerization?
ix. What is reactivity ratio? Give the necessary condition of reactivity ratio to obtain an alternating polymer
x. Distinguish radical chain growth and ionic polymerization. (10 × 3)

Q2.

a) Give two examples of plasma polymerisation along with their significant properties and uses.

b) Describe the stepwise mechanism (Initiation, Propagation, and Termination) for the formation of Polypyrrole.

P.T.O.

c) Describe how NMP is used to synthesize a block copolymer of styrene and 4-vinylpyridine. (5 × 3)

Q3.

a) Discuss kinetics for cationic polymerisation and derive an equation for the degree of polymerisation for cationic polymerisation.
b) Solvent plays a crucial role in ionic chain polymerisation. Justify it.
c) Discuss photochemical initiators with suitable reaction examples and suggest the class of compounds that can give this reaction. (5× 3)

Q 4

a) What are batch reactors? Discuss their merits and applications.
b) For the polymerization of pure (undiluted) styrene with benzoyl peroxide at 60°C, the number-average degree of polymerization, Xn, is given by the general expression:

$$\frac{1}{X_n} = 0.60 \times 10^{-4} + 8.4 \times 10^{2} \frac{R_p}{[M]^2} + 2.4 \times 10^{7} \frac{R_p^2}{[M]^3}$$

For a rate of polymerization of 10^{-4} mol/l-s and monomer concentration of 8.35 mol/l calculate:

i. The value of the transfer constant to the monomer
ii. Number-average degree of polymerization, Xn
iii. Xn assuming there is no transfer (normal termination) (5, 10)

Q.5

a) Derive an expression for a polymerization for rate and percent conversion carried in a batch reactor.
b) It has been found that the polymer from a certain toxic monomer has excellent mechanical properties as a food wrap. To ensure maximum conversion and obtain a relatively pure product, the monomer was bulk polymerized in a batch reactor. Do you agree with the decision to use this polymer as a food wrap?
c) Discuss the cage effect in the context of chain growth polymerization. (5 × 3)

Q.6

a) Derive an expression for rate for chain growth polymerization
b) Discuss the methods to control molecular weight in step growth polymerization.
c) Illustrate the role of reactor in polymerization. (5 × 3)

Q.7 Write a note on the following (**Any three**)

a) Suspension polymerization
b) Alfrey Price scheme
c) CSTR
d) Ceiling Temperature (5 × 3)

(200)