Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Programme : B.Sc. (Hons)-Chemistry by Research **Semester : VII**
Course : Polymer Chemistry and Technology **Time : 03 hrs**
Course Code : CHEM4031P **Max. Marks: 100**
Nos. of page(s : 2

Instructions:

- Write your name and enrolment no. at the top of the question paper.
- Do not write anything else on the question paper except your name and roll number.
- Attempt all the parts of a question at one place only.
- CO in the last column stands for course outcomes and it is for official use only.
- Schematic representations and suitable examples are highly encouraged during answering the questions.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define polymers and describe their classification based on structure and origin.	**4**	**CO1**
Q 2	Explain the role of catalysts in polymerization reactions.	**4**	**CO2**
Q 3	Compare bulk and solution polymerization techniques.	**4**	**CO2**
Q 4	List four common applications of polymers in packaging.	**4**	**CO3**
Q 5	Given a polymer sample with a polydispersity index (PDI) of 1.2 and a weight-average molecular weight of 6000 g/mol, calculate its number-average molecular weight.	**4**	**CO1**
SECTION B **(4Qx10M= 40 Marks)**			
Q6	Explain the polymer bio-composite. How do they differ from traditional polymer composites? How do surface treatments and compatibilizers enhance the performance of polymer bio-composites?	**2+2+6**	**CO3**
Q7	Differentiate chain-growth and step-growth polymerization with suitable examples and equations.	**10**	**CO1**
Q8	Illustrate plausible relation of tacticity and crystallinity of polymers (Give proper example). How does the melting point and thus processing temperature of polymer (s) are expected to change with the tacticity.	**4+6**	**CO2**
Q9	Schematically represent the basic structure and explain the principle of extruder. State the reason, why all types of polymers are not extrudable. **OR**	**6+4**	**CO2**

	State a synthetic approach to prepare artificial Gutta percha (trans-polyisoprene) from the isoprene monomer.	**10**	
SECTION-C (2Qx20M=40 Marks)			
Q10	a) For tyre tread applications, why rubber is given importance over other polymers? b) Define "vulcanization of rubber". c) What is the common filler material being used with rubber in tyre tread? d) Alternative fillers are preferred over the conventional fillers, why? e) Choose the possible better filler among silica, graphite, bio-fillers (e.g., hemp, jute, sisal, etc.) to replace the traditional filler used in tyre tread. State if any surface modification or compatibilizer is required for the processing.	**3+3+2+4+8**	**CO3**
Q11	Differentiate among the following (keeping examples of polymer/s if needed) a. Tg and Tm b. TGA and DSC c. UV-Vis and FTIR spectra How does the presence of fillers or additives (e.g., C-black, glass fiber, plasticizer etc.) influence the results obtained from TGA and DSC analysis of polymers? **OR** a) Write the common manufacturing techniques for polymer composites to be used in different applications. b) Highlight one easiest characterization technique to realize compatibility between two polymers for preparing their composite. c) How do the results from mechanical analysis influence the choice of a polymer for specific applications?	**12+8** **5+7+8**	**CO2**