B. CHEM 4TH YEAR 2ND SEMESTER EXAMINATION-2017 (OLD)

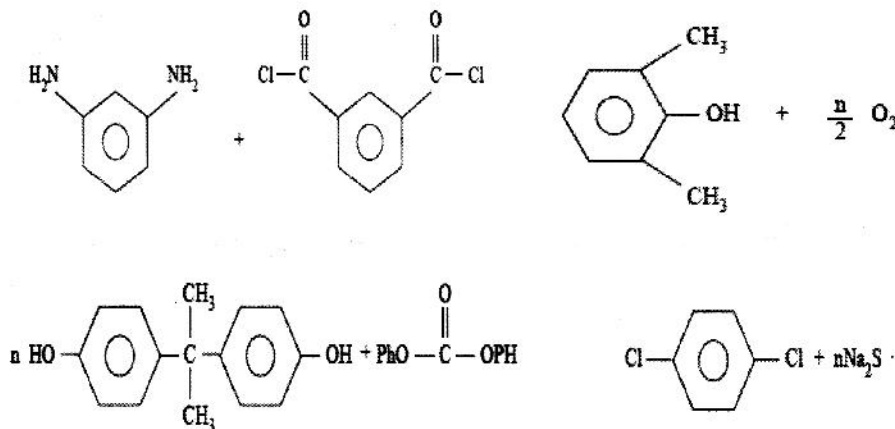SUBJECT: HIGH POLYMER TECHNOLOGY

FM-100   TIME-3HRS

ANSWER ANY FIVE (TO THE POINT ANSWER IS ENCOURAGED

1. (a) Draw the repeat unit of the polymer formed (10)

(b) Two hundred grams of polymer consist of the fractions shown in the following table. What are the values of M_n, M_w, and the polydispersity index of the sample. State two key difference addition and condensation polymerization (7+3)

Fraction	Mass (g)	Molecular Weight (g/gmol)
I	100	2×10^3
II	50	2×10^4
III	50	1×10^5

2. (a) State the importance of Chain Transfer Reaction. Show the mechanism of Metathesis Polymerization. (10)

(b) M_n of polyester is 8000 with poly dispersity index of 2. Now the system is fractioned into two samples with M_n of 3500 and 12500, respectively. Find out the M_n and M_w of the new system. Comment on the result in terms of melt viscosity. (10)

3. Write short notes on the following:

(i) Stoitiometric imbalance (ii) Tacticity (iii) Glass-Rubber Transition behavior (iv) Emulsion Polymerization (5*4=20)

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4. (a) You have been asked to prepare a polymer with Mn of 10000 via unimolar reaction between butane 1,4-di ol and adipic acid.

(i) Calculate the extent of reaction (4)

(ii) Lets say 2 mol% di ol is lost during the course of polymerization. Find out the value of Mn in that situation. (6)

(iii) Suppose 1 mol of adipic acid contains 2% of acetic acid as impurity. What would be the extent of reaction to achieve the desired product? (6)

(b) Define toughness of a Visco-elastic material. Draw the stress-strain curve of a hard and tough material. (4)

5. (a) Describe with schematic the track etching process of membrane fabrication. (7)

(b) Consider the isothermal free radical polymerization of styrene at 60°C. Assume that the initiator is 100% efficient and has a half-life of 44 h. At 60°C, k_p = 145 l/mol-s, k_t =0.130 l/mol-s. All ingredients have unit density.

Derive the rate expression for this polymerization reaction. (8)

(c) What are the disadvantage and advantageous features of bulk polymerization technique? (5)

6. (a) 0.20 gm of a polymer sample has been dissolved in 100 ml of solvent. The respective flow time at RT is mentioned below:

Flow time $_{solvent}$ = 100 sec

Flow time $_{Polymer\ solution}$ = 150 sec

Given: K= $3*10^{-2}$ and a = 0.6

Determine the molecular weight of a Polymer sample. (8)

(b) Draw the schematic of a Plastic Extruder. What are the screws used in Extrusion process? State their roles. How do you control the heat build up inside the barrel? (6+3+3)