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SEAT No._____

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SARDAR PATEL UNIVERSITY

M.Sc. 2nd Semester (Surface Coating Technology) (CBCS) Examination

Tuesday, April 10th, 2018

Time: 10:00 am to 01:00 pm

Course No.: PS02CSCT21

Subject: Polymer Physics & Properties of Polymer

Total Marks: 70

N.B. (1) Marks allotted to the question are on its RHS
(2) Illustrate your answers wherever necessary with the help of neat sketches & chemical

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Q.1. Choose the ***Correct Answer*** from the followings:

1.1 Which of the following is the strongest force? 1

a) London dispersion b) Dipole interaction c) H-bonding d) Covalent bond

1.2 Due to cross-linking in polymer, Tg of the polymer will _____? 1

a) Increase b) Decrease c) No change d) Increase and then decrease

1.3 In hard rubber, which type of cross-linking is observed? 1

a) Labile b) Light c) High d) None

1.4 Which of the following will have higher Tg? 1

a) Polyethylene b) Polystyrene c) Polyvinylcarbazole d) Polypropylene

1.5 Which of the Brownian movement is activated above T_f in case of polymer? 1

a) IBM b) EBM c) Both d) None

1.6 Chain end degradation is also known as_____. 1

a) Depolymerization b) Unzipping c) Both a & b d) None

1.7 Crystalline solid can exist in _____ state. 1

a) Solid b) Liquid c) Glassy solid d) Both b & c

1.8 Which of the following is more thermally stable? 1

a) Polyethylene b) PTFE c) Polyphynelene d) Polytetrafluorophenylene

Q.2) Answer the following short questions (any seven) 14

a) List out the different types of monomers class used for addition polymerization.

b) The T_g of polymer increases with increasing branching. Explain citing suitable example.

c) Crystallinity depends on geometrical structure of polymer. Explain giving suitable example.

d) How photostabilizer prevent the photodegradation of polymer. Explain giving suitable example.

e) What are spherulites? How they affect property of polymer?

f) Define true solvent and non-solvent.

g) Discuss different types of co-polymers.

h) Describe the equation to find out T_g of homopolymer and co-polymer.

i) Define cohesive energy density.

(P.T.O.)

Q.3 a. i) Increase in length of side chain increases T_g. Justify giving suitable example. 6

ii) Describe the classification of polymer on the basis of chemical structure.

b. Describe the following polymers in isotactic, syndiotactic and atactic forms. 6

i) polyvinyl alcohol ii) polymethylacrylate

And also describe cis, trans and vinyl structure for polybutadiene

OR

Q.3 a. i) Explain dilatometry technique to find out T_g of polymer. 6

ii) Write a note on plasticizer.

b. Write a note on state of aggregates and state of phases in case of polymers. 6

Q.4 a. Explain how structural regularity of polymer affects crystallinity. 6

b. i) Write a note on degree of crystallinity. 6

ii) Define quenching and explain why 100% crystalline polymer formation is difficult.

OR

Q.4 a. Describe the factors affecting T_g. 6

b. Describe the Tg curves for amorphous, crystalline and partly crystalline polymers. 6

Q.5 a. i) Discuss heavy cross-linking and its effect on polymer properties. 6

ii) What will be the effect on processability, mechanical properties and chemical properties due to cross-linking?

b. Write a note on permanent dipoles in polymers and how it affects different properties of polymers. 6

OR

Q.5 a. Discuss the different types of forces that are encountered in polymers and write a note on London Dispersion Force. 6

b. Write a note on oxidative degradation and antioxidant used to prevent degradation. 6

Q.6 a. Describe the mechanism of degradation of PVC and how it can be minimized. 6

b. Write a note on degradation and explain unzipping and random degradation. 6

Also list out factors affecting degradation.

OR

Q.6 a Describe degradation by mechanical force and ultrasonic waves. 6

b. i) Discuss ozone oxidation in polymers taking suitable example. 6

ii) Write a note on photodegradation.

X