

SEAT No. \_\_\_\_\_

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**SARDAR PATEL UNIVERSITY**

M.Sc. (Polymer Science & Technology) Semester-IV Examination-2018

Tuesday, 10<sup>th</sup> April-2018

2:00 P.M. to 5:00 P.M.

**PS04CPST08: POLYMER RHEOLOGY**

Total Marks: 70

- Note: (1) Attempt all questions.  
(2) Figures to the right indicate marks.

**Q. 1** Answer the following multiple choice questions. **08**

- (1) Surface irregularity is known as \_\_\_\_\_.  
(i) die swell (ii) parison sag (iii) sharkskin (iv) All.
- (2) Flexible polymer chains adopt the shape of random coil in absence of \_\_\_\_\_.  
(i) strain (ii) stress (iii) both i & ii (iv) none of above.
- (3) The applied stress is proportional to the strain is known as \_\_\_\_\_.  
(i) Pascall's law (ii) Metzner rule (iii) Hooke's law (iv) Poiseuille rule.
- (4) Polymer exhibits a time dependant strain response to a constant applied stress. This behavior is called \_\_\_\_\_.  
(i) fatigue (ii) creep (iii) Bingham plastics (iv) modulus.
- (5) Chain \_\_\_\_\_ must have sufficient thermal energy for motion.  
(i) segment (ii) part (iii) molecule (iv) All.
- (6) \_\_\_\_\_ is the retardation of a chemical system reaching equilibrium.  
(i) Thixotropy (ii) Hystersis (iii) Anti thixotropy (iv) Frozen in orientation.
- (7) Melt fracture \_\_\_\_\_ by giving proper tapering at die entry.  
(i) increases (ii) averages (iii) decreases (iv) none of above.
- (8)  $\tau =$  \_\_\_\_\_.  
(i)  $\frac{r}{R} \times \tau_w$  (ii)  $r \times R \times \tau_w$  (iii)  $\frac{rR}{\tau_w}$  (iv)  $\frac{R}{r} \times \tau_w$

**Q. 2** Attempt any seven of the following. **14**

- (1) Explain various parameters on which rheology of polymer depends.
- (2) Give the reasons for deriving quantitative relationships for flow of object through channel of simple cross-section.
- (3) Define: (1) Elasto viscous behaviour (2) Stress.
- (4) Explain chain stiffness and conformation.
- (5) Derive Metzner equation for shear rate.
- (6) Derive Poiseuille equation.

C.P.T.O.)

(7) How Weissenberg effect is observed? Explain.

(8) Explain jetting and fountain effect.

(9) Explain important aspects of rheology.

Q. 3 (a) Derive Rabinowitch equation used for flow through capillary. 06

(b) Write a note on time dependent fluid. 06

OR

(b) Answer following. 06

1. Derive the relation used for the shear stress at the wall during flow through parallel plate.

2. Discuss in detail about molecular weight distribution.

Q. 4 (a) Give an account on effects of molecular structure on rheology. 06

(b) Derive  $Q = hVd - \frac{h^3}{12\eta} \frac{dp}{dx}$  for calendaring process. 06

OR

(b) Discuss the effects of temperature on viscous flow of polymer melts. 06

Q. 5 (a) Discuss in detail about Maxwell model. 06

(b) Write a note on capillary rheometer. 06

OR

(b) Write a note on following effects. 06

1. Die swell.

2. Melt Fracture.

Q. 6 (a) Write a note on Dispersion, Distribution & Homogeneity during mixing of polymer melt. 06

(b) Explain melting, Material transfer, shaping and finishing used for thermoplastics processing. 06

OR

(b) Answer the following. 06

1. Explain the effects of chain branching on flow properties of thermoplastic polymer.

2. Write a note on bulk deformation.

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