

[This question paper contains 3 printed pages.]

Your Roll No.

3178

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M.E. Polymer Technology

Paper—CH.654

(Polymer Processing)

Time : 3 Hours

Maximum Marks : 100

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt any five questions.

All questions carry equal marks.

1. (a) What are the various aspects of the polymer processing ? 8
- (b) How do you calculate the energy requirement of a polymer process ? Support your answer with an example. 8
- (c) Explain incompressible Non-Newtonian Fluids. 4
2. (a) Comment on the role of additives in polymer compounding. Enlist various additives used in polymer processing. Discuss any two of them. 10
- (b) Give details of any two methods to produce cellular polymers ? Mention the mechanism of the blowing agent functioning therein. 10

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3. Define viscoelastic materials. Write about Maxwell and Kelvin models to understand the behaviour of these materials. Give an account of governing equations also.

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4. (a) Derive WLF equation from volume concept. 4
(b) Applying Carrau model to polypropylene the following constants are obtained $\eta_0 = 2350 \text{ Ns/m}^2$, $A_T = 0.05$, $n = 0.33$. The glass transition temperature for polypropylene is -10°C .

Calculate the viscosity of polypropylene at 230°C and a shear rate of 1000 s^{-1} . 8

- (c) A blow moulding die has an outside diameter of 30 mm and an inside diameter of 27 mm. The parison is inflated with a pressure of 0.4 MN/m^2 to produce a plastic bottle of diameter 50 mm. If the extrusion rate used causes a thickness swelling ratio of 2, calculate the wall thickness of the bottle. 8
5. (a) Derive an equation for the analysis of flow in an extruder considering the material flow as isothermal and the viscosity of the material as constant. 10
(b) Describe briefly about various flow defects. Suggest the remedies for their minimization. 10
6. (a) Discuss about any three experimental techniques employed to obtain flow data on polymer melt. 10

- (b) Write about the calendering process for the manufacture of polymer films. 10
7. (a) Differentiate the compression molding from rotational molding process. Explain the facts. 12
- (b) Enlist various types of reinforcing agents, classify polymer composites on the basis of these agents. Mention the technical applications of polymer composites. 8
8. Write short notes on *any three* of the following :
7 + 7 + 6
- (a) Expansion and contraction of amorphous polymers.
- (b) Screw pumps.
- (c) Reaction Injection molding.
- (d) Filament winding.
- (e) Injection Molding Machine cycles.
- (f) Anti-ageing additives.