

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: BE
BRANCH: CHEM**

**SEMESTER : VI
SESSION : SP/19**

SUBJECT: CL6007 POLYMER SCIENCE AND ENGINEERING

TIME: 3 Hours

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
 2. Candidates may attempt any 5 questions maximum of 60 marks.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Write the two conditions for a polymer to be conductive and write the chemical structure of any two conductive polymers. [2]
- Q.1(b) Write detailed notes on classification of polymers. [4]
- Q.1(c) Depict classification of fillers with a branch diagram and discuss the roles of fillers in Polymer compounding. Also write brief notes on types of UV absorbers. [6]
- Q.2(a) Discuss the four different types of polymer molecular weights and write the name of one technique by which each can be determined. [2]
- Q.2(b) Write detailed notes on morphology of semi-crystalline polymers including models. [4]
- Q.2(c) Describe any two instrumental methods used to determine polymer average molecular weights with principles, procedures, figures and all necessary data. [6]
- Q.3(a) Define T_g and list names of techniques used to determine it. [2]
- Q.3(b) Write brief notes on (i) HDT(ii) Vicat softening Pt. (iii) TGA and (iv) DETA [4]
- Q.3(c) Describe in detail the main two instrumental methods used for estimation of T_g . [6]
- Q.4(a) What is viscoelasticity? Discuss the two basic viscoelastic models. [2]
- Q.4(b) What is Rheology? Write short notes of types of rheometers. [4]
- Q.4(c) Describe in detail Tensile testing and Flexural testing methods with theory, procedure, specimen dimensions, figures and characteristic curves. [6]
- Q.5(a) Differentiate Commodity, Engg. and Speciality plastics. Give examples. [2]
- Q.5(b) Compare SMC, BMC with examples and describe production of phenol formaldehyde resin with a neat flow sheet. [4]
- Q.5(c) Describe production of Nylon and LDPE with neat flow sheets. [6]
- Q.6(a) Mass flow rate of an extrusion pipe line is 1101 lb/h. Enthalpy of polymer is 280 Btu/lb. Estimate motor size in HP, if mechanical energy efficiency is 70%. [2]
- Q.6(b) Write short notes on calendaring and Blow molding techniques with figures. [4]
- Q.6(c) Draw a neat schematic of a single screw extruder showing all parts. Discuss the functions of different zones of the screw and detail the geometrical factors of the screw. Also write the simplified final screw characteristic equation. [6]
- Q.7(a) Calculate clamping force in tons for a mold with 8 cavities and cavity pressure of 300 Kgf/cm². Maximum area of one cavity is 15.3 cm² and total runner area is 5.5 cm². [2]
- Q.7(b) Write summarized notes on compression molding, thermoforming and rotomolding. [4]
- Q.7(c) Draw a neat cross-sectional sketch of an injection mold with two halves, showing all the components and parts pin-pointing the exact locations. Also describe the standard injection molding cycle. [6]

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