Reg. No.															

Question Paper Code	13410

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Eighth Semester

Mechanical Engineering

20MEEL804 - POLYMER MATERIALS AND THEIR PROCESSING

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which polymerization technique is characterized by the use of heat and pressure to facilitate the reaction? (a) Emulsion polymerization (b) Bulk polymerization (c) Solution polymerization (d) Suspension polymerization	1	K1	CO1
2.	The relationship between the structure of a polymer and its properties is primarily influenced by: (a) The molecular weight only (b) The color of the polymer (c) The arrangement of monomers in the polymer chain (d) The temperature of manufacturing	1	K1	CO1
3.	Which method is commonly used to determine molecular weight based on flow properties? (a) Infrared Spectroscopy (b) Nuclear Magnetic Resonance (c) Viscometry (d) Differential Scanning Calorimetry	1	K1	CO2
4.	In gel permeation chromatography (GPC), polymers are separated based on what property? (a) Charge (b) Density (c) Size (d) Color	1	K1	CO2
5.	What happens during the yielding of a polymer? (a) The polymer undergoes plastic deformation under stress, with no recovery. (b) The polymer breaks into pieces. (c) The polymer changes from a rubbery to a glassy state. (d) The polymer undergoes reversible deformation.	1	K1	CO3
6.	Which phenomenon describes the time-dependent recovery of a polymer after stress is removed? (a) Creep (b) Stress relaxation (c) Yielding (d) Fracture.	1	K1	CO3
7.	In the tubular blown film process, which of the following is true? (a) The film is formed by extruding the polymer through a mold. (b) The extruded polymer is inflated to form a tube of film. (c) The process does not require any cooling step. (d) The polymer is cooled by direct contact with a cooling plate.	1	K1	CO4
8.	In the blow molding process, what is the role of air pressure? (a) To cool the mold quickly. (b) To form the shape of the hollow part by inflating the polymer. (c) To remove excess polymer from the mold. (d) To increase the viscosity of the polymer.	1	K1	CO4
9.	In Reaction Injection Moulding (RIM), which of the following is true? (a) Both components of the polymer are mixed in a liquid state before being injected into the mould (b) The process uses only thermoplastic polymers (c) It involves solidifying a polymer through heat (d) The moulding process occurs in an open air environment	1	K1	CO5

10.	High-performance polymers are typically characterized by which of the following properties? (a) Low strength and high flexibility (b) High cost but low durability (c) High strength, heat resistance, and chemical stability (d) High electrical conductivity but low thermal stability	*1*	*K1*	*CO6*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Differentiate bulk and suspension polymerization.	*2*	*K2*	*CO1*
12.	Define chain polymerization.	*2*	*K1*	*CO1*
13.	Define gel permeation chromatography.	*2*	*K1*	*CO2*
14.	State the significance of modification in chemical polymer.	*2*	*K1*	*CO2*
15.	Compare the relationship between the glass transition temperature (Tg) and the melting temperature (Tm) in polymers.	*2*	*K2*	*CO3*
16.	Summarize the causes of photo-degradation in polymers.	*2*	*K2*	*CO3*
17.	Distinguish between thermoforming and vacuum forming.	*2*	*K2*	*CO4*
18.	Define calendaring process.	*2*	*K1*	*CO4*
19.	Define reaction injection moulding process.	*2*	*K1*	*CO5*
20.	Identify the importance of polymer compounding.	*2*	*K1*	*CO5*
21.	Define polymer alloys, and how do they differ from polymer blends?	*2*	*K1*	*CO6*
22.	State the polymer composites.	*2*	*K1*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Illustrate the main unit operation in polymer production and state its application.	*11*	*K2*	*CO1*
		OR			
	b)	Describe the key principles of step and chain polymerization.	*11*	*K2*	*CO1*
24.	a)	Identify the number average molecular weight (Mn) and its and its significance in polymer characterization.	*11*	*K3*	*CO2*
		OR			
	b)	Discuss the impact of molecular weight on the physical and mechanical properties of polymers.	*11*	*K3*	*CO2*
25.	a)	Discuss the effects of crystallization on polymer properties, and how does it influence their performance.	*11*	*K2*	*CO3*
		OR			
	b)	Describe the degradation mechanisms in polymers in thermal, mechanical and photo degradations.	*11*	*K2*	*CO3*
26.	a)	Compare compression moulding process and transfer moulding process and explain their working principles with neat sketches.	*11*	*K4*	*CO4*
		OR			
	b)	Inference the working principle of injection molding process with neat sketch. State its applications.	*11*	*K4*	*CO4*
27.	a)	Identify the key steps involved in fabrication of polymers and state its applications.	*11*	*K3*	*CO5*
		OR			
	b)	Summarize the importance of polymer testing and explain the common methods used for testing polymers and their additives.	*11*	*K3*	*CO5*

28. a) Illustrate the principle of Polymer-Assisted Abrasive Finishing (PAAF) process and how it benefits mechanical and medical components. *11* *K2* *CO6*

OR

b) Explain briefly about the multi-component polymeric materials in detail. *11* *K2* *CO6*