Time: 1hr and 30 min **Max. Marks: 45**

NOTE: 1) Question No.1 is **compulsory**.
2) Attempt any **two** questions from the remaining four questions.
3) Figures to the right indicate the marks allotted to that question.
4) Draw well-labelled diagrams wherever necessary.
5) Assume suitable data wherever necessary.

Q1. **Answer any five of the following:** 15

(a) An alloy consists of 70% copper (Cu) and 30% zinc (Zn) by weight. (Density of copper = 8.96 g/cm³, Density of zinc = 7.14 g/cm³).Calculate the density of the alloy.
(b) What are ceramics? State the properties and uses of any one type of Natural Ceramics.
(c) What are the emerging applications of biocomposites?
(d) Explain the synthesis of PMMA and discuss its properties. Mention at least two important uses
(e) Define Liquid Crystal Polymer and explain how its properties make it useful in electronics or automotive industries.
(f) What are carbon nanotubes? Differentiate between Single-Walled and Multi-Walled Carbon Nanotubes.
(g) A polymer fiber with a cross-sectional area of 5 mm² is subjected to a force of 125 N before failure. Find the tensile stress at the point of failure.

Q2 (a) Define optical fibers and explain their construction with a labeled diagram and write any two applications of it. 6

(b) Explain the structure and unique properties of graphene. Give any two applications of nanomaterials in the medicinal field. 5

(c) Define smart polymers. Discuss their important characteristics and list some of their applications. 4

Q3 (a) Define compounding of plastics. What is the significance of each component added during compounding? Explain their roles with examples. 6

(b) Explain the various types of Particulate reinforced composite? Mention their applications. 5

(c) Explain the properties and uses of Borosilicate and Soda-lime glass. 4

Q4 (a) State the composition, properties and uses of 6
i. Dutch metal
ii. Woods metal

(b) Explain classification of various types of nanostructured materials in detail. 5

(c) Calculate the Degree of Polymerization of a polystyrene molecule with a molecular weight of 150,000 g/mol, given that the molecular weight of a styrene monomer is 104 g/mol. 4

Q5 (a) Define Composite. Explain properties and application Biocomposite. 6

(b) i. State the effects of the Co and W elements on special steels. 2

ii. An alloy is made of 60% iron (Fe) and 40% carbon (C) by weight. Calculate the atomic percentage of each element in the alloy. (Given: Atomic mass of Fe = 55.85 g/mol, Atomic mass of C = 12.01 g/mol) 3

(c) What are conducting polymers? Explain Intrinsic polymer in detail with example. 4

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