20-05-2026 FE SEM-II (NEP-2020) ENGG.MATERIALS QP CODE: 20012292

Time: 1 hour and 30 minutes. **Marks: 45**

N.B.:
1. Questions No. 1 is compulsory.
2. Attempt any two questions from the remaining four questions.
3. Figures to the right indicate full marks allotted to that question.
4. Draw neat labelled diagrams wherever necessary.
5. Assume suitable data wherever necessary.
[$^{1}H_{1}$ $^{6}C_{12,}$ $^{9}F_{18.9}$, $^{29}Cu_{63.54}$, $^{30}Zn_{65.39}$, $^{50}Sn_{118.7}$, $^{82}Pb_{207.2}$, $^{28}Ni_{58.69}$, $^{47}Ag_{107.86}$, $^{13}Al_{29.98}$]

Density (ρ): Al=2.70 g/cm^3, Cu=8.92 g/cm^3, Zn=7.14 g/cm^3, Sn=7.26 g/cm^3, Pb=11.34 g/cm^3, Ni=8.9 g/cm^3.

Q.1	**Attempt any five questions from the following:**	**15**
	a. An Alloy contains Nickel (Ni) 80% and Copper (Cu) 20%. Find the atomic percentage of constituents.	**3**
	b. Define Ceramics. List four Properties of ceramics materials.	**3**
	c. What are particulate composites?	**3**
	d. Define vulcanization of rubber with reaction. Give two advantages.	**3**
	e. A plastic component is made of thermoplastic polyvinyl chloride (PVC) with density of 1.4 g/cm3. If the component has a volume of 270 cm3. Calculate its mass.	**3**
	f. What are Natural biopolymers? Give two advantages of protein as Natural biopolymer.	**3**
	g. Define Nanomaterials. List four types of Nanostructured materials.	
Q.2	a. Define optical fibre. Give advantages and applications of optical fibre. (four each)	**6**
	b. Distinguish between Single walled (SWCNT) and Multiwalled carbon nanotubes (MWCNT).	**5**
	c. What are Thermo responsive polymers and pH responsive polymers.	**4**
Q.3	a. Explain preparation of polytetrafluoroethylene (PTFE) with reaction. Give two properties and uses.	**6**
	b. Discuss fiber reinforced composites with neat labelled diagrams. Give at least two applications.	**5**
	c. Define Lead glass. Give properties and uses of lead glass.	**4**
Q.4	a. Write composition, properties and uses of Duralumin and Dutch metal.	**6**
	b. What are Graphene? Discuss structure and properties of Graphene.	**5**
	c. A polymer sample has a molecular weight of 300000 g/mole and the repeat unit molecular weight is 400 g/mole. Calculate the degree of polymerization.	**4**
Q.5	a. Define Bio-composites with its types. Give at least two applications	**6**
	b. i) Define alloy with an example.	**2**
	ii) An alloy sample weighs 500 gm and consists of 75% iron, 15% chromium and 10 % nickel by weight. Calculate the weight of each component in the alloy.	**3**
	c. What are liquid crystal polymers. Discuss properties and give two applications.	**4**

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