

(2 Hours)

[ Total Marks : 60

- N. B. :**
- (1) Question No. 1 is **compulsory**.
  - (2) Answer any **three** questions from the remaining **five**.
  - (3) **All** questions carry **equal** marks.
  - (4) **Atomic weight** :- Mg = 24, Ca = 40, Si = 28, N = 14, O = 16, C = 12

1. Solve any **five**:-

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- (a) What happens when temporary hard water is boiled? Give equations to explain.
- (b) Give the preparation and uses of Silica refractory.
- (c) Define Gibbs Phase Rule. State the number of Phases, Components and Degrees of freedom for the following equation-  
$$\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$$
- (d) What is the function of plasticiser in the compounding of plastic? Give two examples.
- (e) Two samples of water A and B were analysed for their salt content:
  - (i) Sample A was found to contain 168 mg  $\text{MgCO}_3$  per litre.
  - (ii) Sample B was found to contain 820 mg  $\text{Ca}(\text{NO}_3)_2$  per litre and 2 mg  $\text{SiO}_2$  per litre. Calculate the total hardness of each sample and state which sample is more hard.
- (f) Discuss the conditions under which semisolid lubricants are used.
- (g) Distinguish between thermoplastic and thermosetting resins.

2. (a) 50 ml of standard hard water containing 1 mg of pure  $\text{CaCO}_3$  per ml consumed 20 ml of EDTA. 50 ml of the water sample consumed 30 ml of same EDTA solution using Erichrome Black T indicator. After boiling and filtering, 50 ml of the water sample required 10 ml of the same EDTA for titration. Calculate the total and permanent hardness of water sample. 6
- (b) Draw a neat phase diagram of the one component water system and explain with reference to (i) curves (ii) Triple point. 5
- (c) What are carbon nano tubes? What are their types? Discuss their Electrical and Mechanical properties. 4

3. (a) Discuss the mechanism of thick-film lubrication.

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- (b) Define moulding and discuss the Injection moulding method of fabrication of plastic. 5
- (c) Discuss the limitations of phase rule. 4
4. (a) Give the preparation, properties and uses of: (i) PMMA (ii) Buna-S. 6
- (b) Give well balanced equations of the reactions that take place in the Lime soda process. 5
- (c) Find the saponification value of an oil sample weighing 1.5 g, refluxed with 25 ml of 0.5 N KOH, required 15 ml of 0.5 N HCl for the residual titration. The blank titration reading was 25 ml of 0.5 N HCl. 4
5. (a) Discuss the setting and hardening of portland cement as well as the function of gypsum with balanced equations. 6
- (b) What is glass transition temperature? What are the factors that affect it and what is the significance of it. 5
- (c) An exhausted zeolite softener was regenerated by passing 150 litres of NaCl solution having a strength of 150 g/L of NaCl. If the hardness of the water is 600 ppm. Calculate the total volume of water that is softened by the softener. 4
6. (a) Write short notes on any two:- 6
- (i) Reverse osmosis
- (ii) Electrodialysis
- (iii) Ultrafiltration
- (b) Define conducting polymers. Explain Intrinsic and Doped conducting polymer with appropriate examples. 5
- (c) Define and discuss the significance of the following properties of lubricant (any two):- 4
- (i) Acid value of oil
- (ii) Cloud and Pour point
- (i) Flash and Fire point
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