

[Time: 2 Hours]

[Marks:60]

- N.B:**
1. Question No. 1 is compulsory.
  2. Attempt any three questions from the remaining questions.
  3. All questions carry equal marks
  4. Atomic weights:  
[Ca= 40, C=12, O=16, H=1, Mg= 24, S=32, Cl= 35.5]

**Q.1** Attempt any five of the following: -

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- a. Differentiate between COD and BOD?
- b. Give the preparation, properties and uses of Kevlar.
- c. A 5ml of sample of waste water was refluxed with 30ml of potassium dichromate solution and after refluxing the excess unreacted dichromate required 23 ml of 0.1M FAS solution. A blank of distilled water on refluxing with 30ml of dichromate solution required 36ml of 0.1 M FAS solution. Calculate the COD value of the waste water.
- d. Define Cloud point and Pour point. Discuss its significance.
- e. State the limitations of phase rule?
- f. What are the drawbacks of Natural Rubber?
- g. List the applications of carbon nanotubes.

- Q.2**
- a. Calculate the amount of lime (85% pure) and soda (95%) required for softening of one million liters of hard water whose chemical analysis results are given below:  $\text{MgCO}_3 = 8.4 \text{ mg/L}$ ,  $\text{CaCl}_2 = 22.2 \text{ mg/L}$ ,  $\text{MgCl}_2 = 9.5 \text{ mg/L}$ ,  $\text{CO}_2 = 33 \text{ mg/L}$ ,  $\text{HCl} = 7.3 \text{ mg/L}$ ,  $\text{KCl} = 16.8 \text{ mg/L}$  6
  - b. (i) What are plasticizer and give its functions? 3  
(ii) What are the conditions under which semi-solid lubricants are used. 2
  - C. Explain with the help of chemical reactions 'setting and hardening' process of cement. 4

- Q.3** a. Define Fabrication of plastic. Explain Transfer moulding with labelled diagram. **6**
- b. (i) Define Phase, Component and Degree of Freedom. **3**  
(ii) How is mixing of raw materials done by dry process. **2**
- C. 800 liters of hard water was made soft with zeolite. The exhausted zeolite required a total amount of 40 liters of NaCl solution containing 110 gm per liter for regeneration. Calculate the hardness of water. **4**
- Q.4** a. Explain Demineralization of water by Ion Exchange method **6**
- b. (i) Find acid value of vegetable oil whose 5ml requires 2ml of N/100 KOH during lubrication. **3**  
(Density of oil= 0.92 g/ml)
- (ii) Write a note on Deccay of concrete. **2**
- c. Thermosetting polymers cannot be reshaped and reused. Give reasons. **4**
- Q.5** a. (i) Write short notes: a) Glass transition temperature b) Conducting polymers **6**
- b. (i) What happens when temporary hard water is boiled? Give equations to explain. **3**  
(ii) Give the important functions of Lubricant. **2**
- c. Draw neat labelled phase diagram for water system. **4**
- Q.6** a. What is Lubrication? Discuss the mechanism of Boundary film Lubrication **6**
- b. (i) What is a condensed system? State the condensed phase rule equation. **3**  
(ii) Distinguish between Hard water and Soft of water. **2**
- C. Describe the wet process for manufacture of Portland cement. **4**