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MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL
DEPARTMENT OF CHEMISTRY

COURSE: B.Tech **SEMESTER-I** **End Term Exam DEC-2024**
SECTIONS – F, G, H, I, J **Total Marks: 40** **Time: 2 hours**
SUBJECT: ENGINEERING CHEMISTRY **Subject Code: CHY24107**

Paper Setter : Dr. Savita Dixit
Course Outcomes (COs)
CO1 : To acquire knowledge about the municipal water and water softening
CO2 : To understand fundamentals of solid , liquid and gaseous fuels
CO3 : To learn various mechanism and properties of liquid , semi- solid and solid lubricants
CO4 : To learn concepts of corrosion , its mechanism and methods of control and prevention
CO5 : To enhance knowledge on the preparation and properties of polymers and cement

IMPORTANT INSTRUCTIONS: All questions are compulsory. All Units carry equal marks.			
Ques	**UNIT 1**	**Marks**	**COs**
Q.1. (a)	Calculate the quantity of lime and soda required for softening 50,000 liters of water containing the following salts per litre : $Ca(HCO_3)_2$ – 9.2 mg/l, $Mg(HCO_3)_2$- 7.9 mg/l, , $CaSO_4$ – 15.3 mg/l, MgSO4 – 15.0 mg/l, $MgCl_2$- 3.0 mg/l, NaCl- 4.3 mg/l.	**1 × 03**	**CO1**
(b)	Write short notes on any two: a. Caustic embrittlement b. Break Point Chlorination c. Priming and Foaming	**2 × 01**	**CO1**
(c)	Write in detail the De-ionization process to remove all the cations and anions present in hard water. Explain the set up with the help of a diagram.	**1 × 03**	**CO1**
	UNIT 2		
Q.2. (a)	A Sample of coal contains: C = 93 %, H = 6 % and ash = 1 %. The following data were obtained when the above coal was tested in bomb calorimeter: (i) Weight of coal burnt = 0.92 g (ii) Weight of water taken = 550 g (iii) Water equivalent of bomb and calorimeter = 2,200 g (iv) Raise in temperature = 2.42°C (v) Fuse wire correction = 10.0 cal (vi) Acid correction = 50.0 cal Calculate gross and net calorific value of the coal, assuming the latent heat of condensation of steam as 580 cal/g.	**1 × 03**	**CO2**
(b)	Write short notes on any two: a. Gross and Net calorific value b. Octane and cetane number. c. Producer gas	**2 × 01**	**CO2**
(c)	What are the differences between Proximate analysis and Ultimate analysis of coal? How will you calculate the amount of Nitrogen by ultimate analysis?	**1 × 03**	**CO2**

	UNIT 3		
Q.3. (a)	Explain the mechanism of hydrodynamic and boundary lubrication	**1 × 03**	**CO3**
(b)	Describe with their significance of the following :(Any Two) a. Saponification number b. Steam Emulsification number c. Aniline point d. Carbon residue	**2 × 01**	**CO3**
(c)	What are solid lubricants? Explain the structure of graphite and molybdenum di sulphide.	**1 × 03**	**CO3**
	UNIT 4		
Q.4. (a)	Explain the mechanism of polymerization which is initiated in the presence of benzoyl peroxide.	**1 × 03**	**CO5**
(b)	Write the mathematical formula of number-average molecular weight and weight-average molecular weight of the polymers.	**2 × 01**	**CO5**
(c)	Describe the Wet method of preparation (with equations) of Portland cement with the labeled diagram of Rotary kiln.	**1 × 03**	**CO5**
	UNIT 5		
Q.5. (a)	What is the effect of nature of oxide film on metal during corrosion?	**1 × 03**	**CO4**
(b)	Write short notes on any two: a. Mechanism of wet corrosion by oxygen absorption b. Pitting corrosion c. Sacrificial anodic protection method	**2 × 01**	**CO4**
(c)	Discuss how the following factors influences corrosion: (i) Nature of metal, (ii) Nature of corroding environment.	**1 × 03**	**CO4**