G.R./PRN No.		PAPER CODE	U113-204B (BE)

DECEMBER 2023 BACKLOG EXAMINATION
F.Y. B. TECH.
COURSE NAME: ENGINEERING CHEMISTRY
COURSE CODE: ES10204B
(PATTERN 2020)

Time: [2Hr]   [Max. Marks: 60]

(*) Instructions to candidates:
1) Figures to the right indicate full marks.
2) Use of scientific calculator is allowed.
3) Use suitable data where ever required.

Question No.	Question Description	Marks	CO mapped	Blooms Taxonomy Level
Q.1	i) Calculate permanent hardness of water from following data. Ca $(HCO_3)_2$ = 16.2 ppm, Mg $(HCO_3)_2$ = 7.3 ppm, $CaSO_4$ = 13.6 ppm, $MgCl_2$ = 9.5 ppm and NaCl = 10 ppm. (Atomic weight Ca=40, Mg=24, Cl=35.5, O=16, C=12 and H=1). a) 15 ppm b) 20 ppm c) 30 ppm d) 40 ppm	[2]	.1	A
	ii) Hardness due to 13.6 mg/L of $CaSO_4$ can be expressed in terms of $CaCO_3$ equivalent as _____. a) 10 ppm b) 5 ppm c) 20 ppm d) 1 ppm	[2]	1	A
	iii) Hardness due to 19 mg/L of $MgCl_2$ can be expressed in terms of $CaCO_3$ equivalent as _____. a) 10 ppm b) 20 ppm c) 5 ppm d) 0.19 ppm	[2]	1	A
	iv) 100 ml of water sample requires 38 ml of 1M EDTA during titration. Calculate total hardness of water sample. a) 190 ppm b) 38000 ppm c) 19000 ppm d) 380 ppm	[2]	1	A

v) An exhausted Zeolite softener was regenerated by passing 80 litres of NaCl solution having strength of 6% NaCl. Calculate the $CaCO_3$ equivalent hardness retained on zeolite bedwhich was replaced by NaCl solution. a) 410.256 mg b) 410.256 gm c) 4102.56 mg d) 4102.56 gm	[2]	1	A
vi) A Zeolite softener was exhausted ,when 2000 litres of hard water was passed through it, the softener was regenerated by passing NaCl solution which replaced 1500 gm $CaCO_3$ equivalent hardness captured in the bed. What was the hardness of water? a) 0.075ppm b) 300ppm c) 750 ppm d) 3000 ppm	[2]	1	A
vii) A Zeolite softener was exhausted ,when 10,000 litres of hard water was passed through it, the softener was regenerated by passing NaCl solution which replaced 2300 gm $CaCO_3$ equivalent hardness captured in the bed. What was the hardness of water? a) 0.196 ppm b) 196.58 ppm c) 0.23 ppm d) 230 ppm	[2]	1	A
viiii) 5,000 liters of water was treated by ion exchange process for removing its hardness. The process then required 100 liters of 0.1 N HCl and 100 liters of 0.1 N NaOH for regeneration. Calculate hardness of water. a) 365 ppm b) 500 ppm c) 100 ppm d) 351 ppm	[2]	1	A
ix) Hydration of cement produces small volume changes known as, a) Soundness b) Dehydration c) Calcination d) Hardening	[2]	2	R
x) According to ISI specifications, insoluble residue should not exceed, a) 4 % b) 6 % c) 8 % d) 2 %	[2]	2	U
xi) The argillaceous material is rich in, a) Silica b) Lime c) Stone d) Chalk	[2]	2	R
xii) Following are the applications of Liquid Crystal Polymers except, a) Optical Imaging b) Surface Thermography c) Industrial Gaskets d) Polymer composite material	[2]	2	R

	xiii) The degree of polymerization of the molecule is ----------, where molecular weight of monomer and polymer is 28 and 23968 respectively. a) 856 b) 428 c) 284 d) 256	[2]	2	U
	xiv) Softening, reshaping and recycling are the properties which are associated with the following polymer. a) Thermoplastics b) Thermosets c) Thermotropic d) Lyotropic	[2]	2	R
	xv) Electrolysis involves......at anode and........at cathode. a) Deposition, dissolution b) Dissolution, oxidation c) Reduction, oxidation d) Oxidation, reduction	[2]	2	U
Q.2	**Solve any three out of four** a) Calculate possible number of fundamental vibrations in C_6H_{12}, H_2O, CO_2, C_6H_6 & NH_3	[5]	3	U & A
	b) What are the possible electronic transitions in the following molecules when they are exposed to UV-Visible radiations? i) CH_3- CO-OCH_3 ii) C_6H_6 iii) C_4H_{10}	[5]	3	U & A
	c) Predict and draw graphs in the following conductometric titration and show equivalence point of titration. Explain the nature of graph before and after equivalence point i) HCl vs NaOH (NaOH taken in burette) ii) CH_3COOH vs NH_4OH (NH_4OH taken in burette)	[5]	3	U & A
	d) Explain: 1) How intermolecular and intramolecular hydrogen bonding can be identified by IR spectrum? 2) Write forbidden electronic transitions in UV Visible region. 3) Identify Chromophores and Auxochromes from following functional groups. (i) N=O (ii) -NH2 (iii) C=C (iv) –OH	[5]	3	U & A
Q.3	**Solve any three out of four** a) Identify types of oxide films formed on the surface of following metals (i) K (ii) Ca (iii) Zn (iv) Mo (v) Cu. Explain with oxidation reactions.	[5]	4	R & U
	b) Predict the reactions of hydrogen evolution mechanism for following conditions: Anode – steel tank, Cathode - copper piece and Electrolyte- industrial acidic waste solution. (write reactions at anode, cathode and net reaction)	[5]	4	U & A

c) 1) Predict the most appropriate and economical corrosion protection method for following examples. i) nuts, bolts, screws, spanners & screw drivers ii) buried steel pipelines, ship hull, buried cables 2) Predict the reactions of following coating metals during electroplating. (i) chromium (ii) silver (iii) nickel (write reactions at anode and cathode)	[5]	4	R & U
d) Identify the most appropriate and economical hot dipping corrosion protection method for containers used for storing foods, ghee, oils, pickles, medicines. Explain three step process with figure.	[5]	4	U & A

Blooms Taxonomy Levels Abbreviations:

R: Remembering
U: Understanding
A: Applying
R & U: Remembering & Understanding
U & A: Understanding & Applying