U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2025 Semester End Main Examinations

Programme: B.E. **Semester: II**
Branch: Civil Engineering Stream **Duration: 3 hrs.**
Course Code: 22CY2BSCCV **Max Marks: 100**
Course: Applied Chemistry for Civil Engineering Stream

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Outline the construction and working of the calomel electrode with a neat labeled diagram. Analyze its advantages and disadvantages.	1,2	1, 2	**8**
	b)	What is corrosion? Explain the electrochemical theory of corrosion by taking iron as an example.	1	1	**6**
	c)	What are concentration cells? EMF of the cell $Cd\|CdSO_4$ (0.004 M)$\|\|CdSO_4$(x M)$\|Cd$ is 0.09 V at 300 K. Find out the value of x.	2	2	**6**
		OR			
2	a)	Outline in detail, the process of electroless plating of copper for engineering applications like printed circuit boards. List any two advantages of electroless plating over electroplating.	2	2	**8**
	b)	What is the type of corrosion that may occur in the following cases? i) Iron bolt in contact with copper vessel ii) Partially buried steel pipelines. Explain the corrosion process in each case. Suggest any one preventive method for the above cases.	2	2	**6**
	c)	A thick steel sheet of area 450 $inch^2$ is exposed to moist air. After 2 years it was found to experience a weight loss of 500 g due to corrosion. If the density of brass is 7.8 g/cm^3, K = 534. Calculate corrosion penetration rate in mpy and mmpy.	2	2	**6**
		UNIT – II			
3	a)	What is reformation of petrol? How does reforming increase octane number? Give reactions involved in reformation of petrol.	1	1	**8**
	b)	Define quantum dots. Outline the construction and working of quantum dot sensitized solar cell with a neat labeled diagram.	3	7	**6**
	c)	With a neatly labeled diagram, explain the construction, and working of $LiCoO_2$ battery.	3	7	**6**

			OR			
	4	a)	Define GCV and NCV of a fuel. Calculate the GCV and NCV of a sample of a fuel from the following data: mass of fuel = 1.03 g; mass of water taken in the calorimeter = 2.8 kg; water equivalent of the calorimeter = 355 g; specific heat of water = 4.187 kJ/kg/K; rise in temperature = 2.6 K; % of hydrogen in coal = 6; latent heat of condensation of steam = 2454 kJ/kg.	2	2	**8**
		b)	Elaborate on the production of biodiesel from vegetable oil by trans-esterification process. Highlight the advantages of biodiesel.	3	7	**6**
		c)	Discuss following battery characteristics: (i) Cycle life, and (ii) Shelf life.	1	1	**6**
			UNIT – III			
	5	a)	What are polymer composites? Discuss the synthesis and applications of Kevlar fiber.	1	1	**8**
		b)	How the following polymers are synthesized? Write their reaction along with any one application: (i) PMMA and (ii) nitrile rubber.	1	1	**6**
		c)	Describe the synthesis and applications of wood polymer composites.	1	1	**6**
			OR			
	6	a)	Discuss the synthesis and applications of (i) epoxy resin and (ii) polyglycolic acid.	1	1	**8**
		b)	What is the glass transition temperature (T_g) of a polymer? Explain the following factors with respect to the Tg of polymer with example: i) intermolecular forces ii) stereo regularity.	2	2	**6**
		c)	A sample of polymer consists of 25% of molecules with molecular weight 5000, 25% molecules with molecular weight 6000 and the remaining molecules with molecular weight 8000 g/mol. Calculate number average and weight average molecular weights and PDI.	2	2	**6**
			UNIT – IV			
	7	a)	Outline the manufacturing process of Portland cement. List any two applications of it.	1	1	**8**
		b)	Define refractoriness of a refractory material. Discuss the classification of refractories.	1	1	**6**
		c)	Explain the steps involved in the manufacturing of soda-lime glass.	1	1	**6**
			OR			
	8	a)	Explain the manufacturing of geopolymer concretes. List the properties and applications of it.	3	7	**8**
		b)	Discuss the composition and applications of any three types of glass.	1	1	**6**
		c)	Outline the properties and applications of any two iron alloys.	1	1	**6**

			UNIT – V			
	9	a)	Outline the principle, procedure and calculation involved in the estimation of sodium in a sample by flame photometry.	1	1	**8**
		b)	Discuss desalination of water by electrodialysis process with a neat labelled diagram.	1	1	**6**
		c)	Calculate total, permanent and temporary hardness of a water sample if 25 cm^3 of water sample required 12.2 cm^3 of 0.015 M EDTA solution for titration. The same amount of water sample after boiling required 8.1 cm^3 of same EDTA solution.	2	2	**6**
			OR			
	10	a)	What is the principle involved in COD determination of waste water? Discuss the experimental procedure and calculation part involved in the above method.	3	7	**8**
		b)	Outline the principle, procedure, and instrumentation involved in the colorimetric determination of copper.	1	1	**6**
		c)	Calculate the temporary, permanent and total hardness of water from the following data. The weights of the salts are as follows: $MgSO_4$ = 14 mg/L; $CaSO_4$ = 12 mg/L; Mg $(HCO_3)_2$ = 17 mg/L; $CaCl_2$ = 19.5 mg/L; $MgCl_2$ = 13.5 mg/L; Ca $(HCO_3)_2$= 14.6 mg/L. [Given: Molecular weights of $MgSO_4$ = 120, $CaSO_4$ = 136, Mg $(HCO_3)_2$ =146, $CaCl_2$ =111, $MgCl_2$ = 95, Ca $(HCO_3)_2$ = 162]	2	2	**6**

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