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: I / II**

Branch: Mechanical Engineering Stream **Duration: 3 hrs.**

Course Code: 22CY1BSCME / 22CY2BSCME **Max Marks: 100**

Course: Applied Chemistry for Mechanical 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)		What are ion-selective electrodes? Describe the construction and working of glass electrode.	*CO1*	*PO 1*	**6**
	b)		What is anodizing? Explain the process of anodizing of aluminum and mention its applications.	*CO1*	*PO1*	**8**
	c)		Define corrosion penetration rate. An alloy sheet of area 100 inch^2 is exposed to air near the ocean. After 1 year it was found to experience a weight loss of 35 g due to corrosion. If the density of alloy 7.9 g/cm^3. Calculate CPR in mmpy and mpy. Given: K = 534.	*CO2*	*PO2*	**6**
			OR			
2	a)		What are reference electrodes? Describe the construction and working of calomel electrode.	*CO1*	*PO1*	**6**
	b)		Define metallic corrosion. Describe electrochemical theory of corrosion by taking iron as an example.	*CO1*	*PO1*	**8**
	c)		Write the electrode reactions and calculate the EMF of the given concentration cell at 298 K: Cu(s) / Cu^{++} (0.03 M) // Cu^{++} (0.5 M) / Cu(s). What is the EMF of the cell at equilibrium?	*CO2*	*PO2*	**6**
			UNIT - II			
3	a)		"Knocking decreases the engine efficiency". Justify the statement. Discuss the mechanism of engine knocking with relevant reactions.	*CO2*	*PO2*	**6**
	b)		Explain the construction and working of silicon based solar cell. Mention its advantages.	*CO3*	*PO7*	**8**
	c)		Calculate GCV and NCV of a fuel from the following data. Mass of fuel = 0.75 g, water equivalent of calorimeter = 350 g, rise in temperature = 3.02 ^oC, mass of water = 1150 g, %H = 2.8, specific heat of water 4.12 kJ/kg/°C and latent heat of steam 2454 kJ/kg.	*CO2*	*PO2*	**6**

			OR			
	4	a)	Explain the construction and working of $LiCoO_2$ battery. Mention its advantages.	*CO3*	*PO7*	**6**
		b)	"Reformation improves the quality of petrol". Justify the statement with relevant reformation reactions.	*CO1*	*PO1*	**8**
		c)	Describe the production of hydrogen by water electrolysis. Analyze the disadvantages of hydrogen as a fuel.	*CO3*	*PO7*	**6**
			UNIT - III			
	5	a)	What are polymer composites? Discuss the synthesis and applications of Kevlar.	*CO1*	*PO1*	**6**
		b)	Justify the statement: Tg of Nylon 6,6 is higher than polyethene. Interpret the influence of flexibility on Tg of a polymer.	*CO2*	*PO2*	**8**
		c)	Illustrate the synthesis of (i) U-F resin and (ii) PMMA. Mention their applications.	*CO1*	*PO1*	**6**
			OR			
	6	a)	What are biodegradable polymers? Describe the synthesis and applications of polyglycolic acid.	*CO3*	*PO7*	**6**
		b)	Illustrate the synthesis of (i) Nitrile rubber, and (ii) Polycarbonate and mention their applications.	*CO1*	*PO1*	**8**
		c)	In a sample of a polymer, 20% molecules have molecular mass 15000 g/mol, 35% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, calculate the number average and weight average molecular mass of the polymer, and PDI.	*CO2*	*PO2*	**6**
			UNIT - IV			
	7	a)	What are alloys? Mention the composition, properties and applications of brass and Alnico.	*CO1*	*PO1*	**6**
		b)	Justify the statement: catalytic and thermal properties change depending upon the size of nanoparticles.	*CO2*	*PO2*	**8**
		c)	Illustrate the synthesis of ZrO_2 nanoparticles by sol-gel method.	*CO1*	*PO1*	**6**
			OR			
	8	a)	Explain the classification and properties of ceramics.	*CO1*	*PO1*	**6**
		b)	Illustrate the engineering applications and properties of carbon nanotubes and graphene oxide.	*CO3*	*PO7*	**8**
		c)	Describe the synthesis of nanoparticles by precipitation method.	*CO1*	*PO1*	**6**

			UNIT - V			
	9	a)	Define phase rule. Explain the terms involved in it with examples.	*CO1*	*PO1*	**6**
		b)	Define specific conductance. Describe the estimation of acid mixture by conductometric method.	*CO5*	*PO1, 2*	**8**
		c)	Write any two differences between COD and BOD. 20 mL of sewage water sample is reacted with 25 mL of $K_2Cr_2O_7$ solution and the unreacted $K_2Cr_2O_7$ requires 9.0 mL of 0.25 N FAS solution for titration. Under similar conditions, blank titer value is 15.0 mL. Calculate the COD of the sample.	*CO2*	*PO2*	**6**
			OR			
	10	a)	Explain the determination of total hardness of water using EDTA method.	*CO5*	*PO1, 2*	**6**
		b)	What is electrodialysis? Explain the desalination of water by electrodialysis.	*CO1*	*PO1*	**8**
		c)	Illustrate the application of phase rule for lead-silver system.	*CO1*	*PO1*	**6**

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