Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 17- 12- 2025 **Time:** 09:30am – 12:30pm

School: SOE	**Program:** B. Tech.	
Course Code: CHE2505	**Course Name:** Materials Chemistry for Engineers	
Semester: I	**Max Marks**:100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	12	12	26	24	26

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Define elastomers and give an example.	2 Marks	L1	CO5
2.	Define hardness of water.	2 Marks	L1	CO1
3.	A polymer has a number average molecular weight (M_n) of 31,250 g/mol and molecular weight of the monomer unit is 62.5 g/mol. Calculate its degree of polymerization.	2 Marks	L3	CO5
4.	Define oxidation and reduction of an electrochemical cell.	2 Marks	L1	CO3
5.	Define octane number of a fuel.	2 Marks	L1	CO3
6.	Define secondary battery with an example.	2 Marks	L1	CO3
7.	Mention two effects of corrosion.	2 Marks	L1	CO4
8.	Identify the monomer units of polyethylene and PVC polymers.	2 Marks	L1	CO5
9.	Write two applications of Carbon nanotubes (CNTs).	2 Marks	L1	CO2
10.	Discuss two types of corrosion.	2 Marks	L1	CO4

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Define boiler troubles. Discuss the boiler troubles: sludge, Scale, Priming and Foaming; caused by hard water. Explain their prevention methods.	**10 Marks**	**L2**	**CO1**
		Or			
12.	**a.**	Discuss the desalination process by reverse osmosis with diagram.	**5 Marks**	**L3**	**CO1**
	b.	Calculate the total hardness of a water sample containing the following: $CaSO_4$: 60.0 mg/L ; $MgCl_2$: 7.5 mg/L, $Ca(HCO_3)_2$: 64 mg/L. Express the Hardness in ppm as $CaCO_3$ (Atomic Weights: Ca = 40, Mg = 24, C = 12, O = 16, S = 32, Cl = 35.5).	**5 Marks**	**L2**	**CO1**

13.	**a.**	Discuss the unique size-dependent properties of nanomaterials and their applications in various fields.	**10 Marks**	**L2**	**CO2**
		Or			
14.	**a.**	Discuss in details of Top-Down and Bottom-Up methods of nanomaterial synthesis. Mention their advantages and disadvantages.	**10 Marks**	**L2**	**CO2**

15.	**a.**	Define a Bomb Calorimeter. Discuss its construction with a neat labeled diagram.	**7 Marks**	**L2**	**CO3**
	b.	Discuss Fractional Distillation of Petroleum.	**3 Marks**	**L2**	**CO3**
		Or			
16.	**a.**	Determine the gross calorific value (GCV) and net calorific value (NCV) of a solid fuel using the following data. Weight of coal=0.54 kg, Weight of water taken in calorimeter =780 kg, Water equivalent of calorimeter = 450 kg, Rise in temperature = 4.2^{o}C, % hydrogen = 3.5%. The latent heat of steam is 587 kcal/kg. The specific heat of water is 4.187 kJ/kg·°C.	**10 Marks**	**L2**	**CO3**

17.	**a.**	For a Zn-Cu electrochemical cell, identify the anode and cathode, write cell reactions, and calculate the cell potential using $\boldsymbol{E}°$ $(\boldsymbol{Cu}\mathbf{2}+/\boldsymbol{Cu})$ = +0.342 V, $\boldsymbol{E}°(\boldsymbol{Zn}\mathbf{2}+/\boldsymbol{Zn})$ = − 0.762 V.	**6 Marks**	**L2**	**CO3**
	b.	Discuss different components of batteries.	**4 Marks**	**L2**	**CO3**
		Or			

18.	**a.**	Explain the construction, electrode reactions, and cell output of Zn-C dry cell Battery. Mention its application.	**10 Marks**	**L2**	**CO3**

19.	**a.**	Explain in detail the concept of differential aeration corrosion, describing its mechanism and supporting your answer with a suitable example.	**10 Marks**	**L2**	**CO4**
		Or			
20.	**a.**	Discuss the primary and secondary factors influencing the rate of corrosion.	**10 Marks**	**L2**	**CO4**

21.	**a.**	Distinguish between electroplating and electroless plating.	**5 Marks**	**L2**	**CO4**
	b.	Discuss sacrificial anode and impressed current methods.	**5 Marks**	**L2**	**CO4**
		Or			
22.	**a.**	Describe the process and mechanism of galvanic corrosion with example.	**10 Marks**	**L2**	**CO4**

23.	**a.**	Differentiate between addition and condensation polymer.	**5 Marks**	**L2**	**CO5**
	b.	Calculate the number average molecular weight of polymer using monomers of 20 molecules having molecular mass 50 g/mol, 20 molecules of molecular mass 30 g/mol and 40 molecules of molecular mass 55 g/mol.	**5 Marks**	**L3**	**CO5**
		Or			
24.	**a.**	Discuss the synthesis of Bakelite. Explain its properties and applications.	**10 Marks**	**L2**	**CO5**

25.	**a.**	Define conducting polymer. Discuss the criteria required for polymers to exhibit conductivity, and explain the major applications of conducting polymers.	**10 Marks**	**L2**	**CO5**
		Or			
26.	**a.**	Explain the process of vulcanization and describe the properties of vulcanized rubber.	**10 Marks**	**L2**	**CO5**