

Writing anything except roll number on question paper will be deemed as an act of indulging in unfair means and action shall be taken as per rules.

<b>2E000321</b>	Roll No.: .....	Total No. of Pages: <b>3</b>
	<b>2E000321</b> <b>B. Tech. II Semester End-Term Examination (Main), June-2022</b> <b>Branch: Computer Science &amp; Engineering</b> <b>2FY2-03: Engineering Chemistry</b>	

Time: 3 Hours

Maximum Marks: 140

**Instructions to Candidates:**

The question paper is divided in three parts A, B & C.

- (i) **Part-A:** 7 Basics/Fundamentals related questions (without choice).
- (ii) **Part-B:** 5 Numerical/Analytical questions (with internal choice i.e. attempt one question either A or B from each question).
- (iii) **Part-C:** 5 Descriptive/Analytical/Problem Solving/Design questions (attempt any 3 out of 5).

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination:

1. Nil
2. Nil

### **PART-A**

(Basics/Fundamentals related questions)

All questions are compulsory

- Q.1 (a)** What is degree of hardness? What problems are caused by scale and sludge formation in boilers? [2+2]
- (b)** Why is lubricant needed? Why does graphite act as lubricant? [2+2]
- (c)** What is the dimension wise classification of a nanomaterial? [4]
- (d)** State Hook's Law. Write the equation for calculating absorbance. [2+2]
- (e)** Define Organic fuel. What are the characteristics of a good fuel? [2+2]
- (f)** Justify the statement 'Corrosion can be considered as reverse of metal extraction'. Bolt and Nut made of the same metal is preferred in practice. Why? [2+2]
- (g)** Explain the Complexometric (EDTA) method and its principle for determination of hardness of water? [4]

### **PART-B**

(Numerical/Analytical questions)

- Q.2 (A)** How R4 M4 Model is satisfied. Explain using any one [4+4]
- (i) Survisometer
  - (ii) Econoburette

**OR**

- (B) Calculate the atom economy for reaction [8]
- $$\text{CH}_3\text{CH}_2\text{OH} \longrightarrow \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O}$$
- $$\text{C}_6\text{H}_{12}\text{O}_6 (\text{aq}) \longrightarrow 2\text{C}_2\text{H}_5\text{OH} (\text{aq}) + 2\text{CO}_2 (\text{g})$$

- Q.3 (A) A sample of water on analysis has been found to contain the following in mg/L:  $\text{Ca}(\text{HCO}_3)_2 = 12.5$ ,  $\text{CaCl}_2 = 8.2$ ,  $\text{MgSO}_4 = 2.6$ . Calculate the temporary, permanent and total hardness of the water sample in degree French ( $^\circ\text{Fr}$ ) and degree Clark ( $^\circ\text{Cl}$ ). [8]

OR

- (B) A sample of water was analysed and found to contain temporary magnesium hardness 25 mg/L, permanent magnesium chloride hardness 15 mg/l and permanent calcium sulphate hardness 20 mg/L,  $\text{SiO}_2$  is 300 mg L, and NaCl is 340 mg /L. Calculate the lime and soda required for softening 30,000 L of hard water. [8]

- Q.4 (A) Design a flow battery using solid oxide as an electrolyte. Explain with the help of diagram and reactions. [4+4]

OR

- (B) What is the sacrificial method of protection of metallic surfaces? Explain giving two examples? [4+4]

- Q.5 (A) A sample of coal was found to contain: C=80 %, H=5 % and N=2 % and remaining ash. Calculate the minimum amount of air required for complete combustion of 1 kg of this coal sample. Also calculate the % composition of dry products formed if 45 % excess air is used. <https://www.btubikaner.com> [8]

OR

- (B) Calculate the high calorific value and low calorific value of a coal sample in kcal/kg, having the following ultimate analysis: C = 80%, H = 7%, S = 3.5%, N = 2.1% and ash = 4.4%. [8]

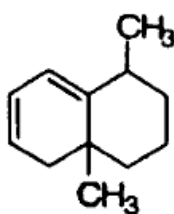
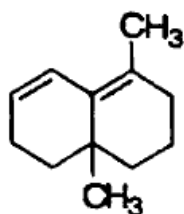
- Q.6 (A) Draw the structural formula of each of the following compounds, and label all sets of equivalent protons. How many NMR signals would you expect to see from each? [8]

- (i)  $\text{CH}_3\text{CH}_2\text{CHO}$ ,  $\text{CH}_3\text{COCH}_3$  and  $\text{CH}_2=\text{CHCH}_2\text{OH}$   
 (ii)  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ ,  $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{OCH}(\text{CH}_3)_2$   
 (iii)  $\text{CH}_3\text{CH}_2\text{OH}$  and  $\text{CH}_3\text{OCH}_3$

OR

(B) Calculate Lambda max for following molecules:

[4+4]



**PART-C**

**(Descriptive/Analytical/Problem Solving/Design questions)  
(attempt any 3 out of 5) (Q.7 to Q.11)**

- Q.7** (i) Explain Sedimentation and sedimentation with coagulation to treat the potable water. [12]  
(ii) Explain Break point chlorination in detail with the help of diagram. [12]
- Q.8** (i) Green Chemistry: The future is in your hand". Justify with the principles of green chemistry. [12]  
(ii) Write notes on: [6+6]  
(a) Seger cone test  
(b) Functions of lubricants.
- Q.9** Write notes on: [8+8+8]  
(i) Pilling-Bedworth rule  
(ii) Galvanization  
(iii) Galvanic Corrosion
- Q.10** (i) Explain the working and construction of bomb calorimeter with the help of diagram. [12]  
(ii) What is meant by cracking? Describe the fluidized-bed catalytic cracking process to obtain gasoline. [12]
- Q.11** (i) What are the various types of vibrations in a molecule when it is placed in IR radiation? [10]  
(ii) State Lambert Beer's Law? Write notes on application of UV-visible spectroscopy. [4+10]

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