**Roll No:**

# B TECH
## (SEM-I) THEORY EXAMINATION 2020-21
## ENGINEERING CHEMISTRY

*Time: 3 Hours*                                                                 *Total Marks: 100*

**Note:** **1.** Attempt all Sections. If require any missing data; then choose suitably.

### SECTION A

**1.**      **Attempt *all* questions in brief.**           **2 x 10 = 20**

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | Explain impurity defects. | 2 | 1 |
| b. | Why Teflon is highly chemically resistant? | 2 | 5 |
| c. | What is selection rule? | 2 | 2 |
| d. | On the basis of IR spectra, distinguish between intermolecular and intramolecular hydrogen bonding. | 2 | 2 |
| e. | Calculate Phase, Component and Degree of freedom in the given system;<br>$C_{(s)} + \frac{1}{2} O_2 \underset{\leftarrow}{\rightarrow} CO(g)$<br>$C_{(s)} + O_2 \underset{\leftarrow}{\rightarrow} CO_2(g)$ | 2 | 3 |
| f. | Why calgon is better than other internal process for water treatment? | 2 | 4 |
| g. | Give the preparations of Grignard reagent. | 2 | 5 |
| h. | Why $O_2$ is paramagnetic and $N_2$ is diamagnetic? | 2 | 1 |
| i. | How can sulfur be estimated by ultimate method? | 2 | 5 |
| j. | How much rust ($Fe_2O_3.3H_2O$) can be produced by 3g of iron? | 2 | 3 |

### SECTION B

**2.**      **Attempt any *three* of the following:**           **3 x 10 = 30**

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | With the help of Molecular orbital theory how Metallic bonding in metals can be explained? | 10 | 1 |
| b. | Write the criteria for a molecule to show Raman, IR, Rotational and UV Spectra. Give the possible electronic transitions (UV spectra) in- $CH_3CH_2CH_3$, $CH_3CH=CH_2$, $CH_3CH=O$ and $CH_3-CH=CH-CH=CH-CH_3$. How many fundamental Vibrational degrees of freedom are expected. for the following molecules: $CO_2$, $H_2O$ and $C_2H$? | 10 | 2 |
| c. | The percentage composition of coal sample is: C = 70 %, $H_2$ = 10 %, $O_2$ 1%, S= 5%, ash = 0.5 % and N = 0.3 %.<br>i. Calculate the quantity of air needed for complete combustion of 1kg of coal, if 60% excess of air is supplied.<br>ii. Calculate the gross and net calorific value of the coal using dulong's formula. | 10 | 4 |
| d. | Give significance of Nernst equation.<br>Consider a cell reaction: $Zn / Zn^{2+}[0.1M] \parallel Cu^{2+}[0.2M] / Cu$<br>Standard reduction potential of $Zn^{2+}$ and $Cu^{2+}$ are -0.76V and 0.34V respectively. Write half-cell reactions, complete cell reaction and calculate EMF of the cell. | 10 | 3 |
| e. | Distinguish between addition and condensation polymerization. Give monomers and one use each of PMMA, Polyethylene, Bakelite, PVC, nylon6,6.,Buna S. | 10 | 5 |

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## SECTION C

**3.** **Attempt any *one* part of the following:**

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | i. Explain types of Non stoichiometric defects with examples.<br>ii. Calculate bond order, magnetic behavior and order of stability of NO, $NO^-$, $NO^+$ | 10 | 1 |
| b. | Write a note on liquid crystal describing classifications and applications of liquid crystals. | 10 | 1 |

**4.** **Attempt any *one* part of the following:**

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | The e.m.f. of the cell cd \| $cdcl_2$, 2.5 $H_2O$ (Saturated) \|\| $AgCl_{(s)}$ \| Ag involving following reaction $Cd(s) + 2AgCl_{(s)}aq \leftrightarrow cdcl_2$ $2.5H_2O$(Saturated)$+2Ag_{(s)}$ is 0.6753V and 0.6915V at $25^0C$ and $O^0C$. Calculate $\Delta H$, $\Delta G$ and $\Delta S$ at $25^0C$. | 10 | 3 |
| b. | Draw the Phase diagram of water and explain triple point and metastable state. | 10 | 3 |

**5.** **Attempt any *one* part of the following:**

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | Write Notes on chromophores and Auxochrome. Explain Transitions in UV spectra. | 10 | 2 |
| b. | Explain the Microwave (Rotational) spectra of diatomic molecule and write their applications. | 10 | 2 |

**6.** **Attempt any *one* part of the following:**

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | Draw diagram of Bomb calorimeter. Explain proximate analysis of coal. | 10 | 4 |
| b. | Explain Ion exchange process of water softening. Zeolite softener was 90% exhausted, when 10,000 hard water was passed through it. The softener required 200 L of NaCL solution of strengths 50 gm/L. Calculates the hardners of water. | 10 | 4 |

**7.** **Attempt any *one* part of the following:**

| Q no. | Question | Marks | CO |
|---|---|---|---|
| a. | Explain with equations preparations of acid, ketone, alcohol, alkanes and Organometallic compound from Grignard reagent. | 10 | 5 |
| b. | What are composite materials? Give the classifications of composite materials? | 10 | 5 |