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Roll No. ....

**TCH-101**

**B. TECH. (FIRST SEMESTER)**

**MID SEMESTER**

**EXAMINATION, 2021-22**

**(All Branches)**

**ENGINEERING CHEMISTRY**

**Time : 1 : 30 Hours**

**Maximum Marks : 50**

**Note :** (i) Answer all the questions by choosing any *one* of the sub-questions.

(ii) Each question carries 10 marks.

1. (a) On the basis of MOT, explain why  $O_2$  is paramagnetic in nature. Also draw the molecular orbital diagram of  $O_2$  molecule.

OR

(b) What do you mean by H-bonding ? Also explain its classification and significances.

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2. (a) Explain band theory of metallic bond with proper example. (CO1)

OR

- (b) Discuss the main postulates of VSEPR theory with the help of structure of  $\text{H}_2\text{O}$  and  $\text{NH}_3$  molecule. (CO1)

3. (a) Write the difference between bonding and anti-bonding molecular orbital. Draw the molecular orbital diagram of  $\text{HF}$  molecule. (CO1)

OR

- (b) Draw the MOT diagram of  $\text{N}_2$  molecule. Arrange  $\text{N}_2$ ,  $\text{N}_2^+$ ,  $\text{N}_2^-$  and  $\text{N}_2^{2-}$  in increasing order of stability. (CO1)

4. (a) Explain about the Zeolite method for softening of water with its advantages and disadvantages. (CO5)

OR

- (b) Why is hardness of water calculated in terms of  $\text{CaCO}_3$  equivalent ? A sample of

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water on analysis was found to consist the following impurities :

$\text{Ca}(\text{HCO}_3)_2 = 16.2 \text{ ppm};$

$\text{Mg}(\text{HCO}_3)_2 = 7.3 \text{ ppm};$

$\text{CaSO}_4 = 13.6 \text{ ppm};$

$\text{MgCl}_2 = 9.5 \text{ ppm}.$

Calculate the temporary and permanent hardness of water. (CO5)

5. (a) Discuss the Ion-Exchange method of water treatment with the help of a diagram. Also discuss the regeneration process of Ion-Exchange columns. (CO5)

OR

- (b) Explain about Lime-Soda method for water softening with the help of appropriate chemical reactions. (CO5)

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