



Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

Name of the Course: B.Tech

semester: I

Name of the Paper: Engineering Chemistry

Paper Code: TCH-101

Time: 1.5 hour

Maximum Marks: 50

Note:

- (i) Answer all the questions by choosing any one of the sub questions
- (ii) Each question carries 10 marks.

Q1.

(10 Marks)

- a. Draw the molecular orbital diagram of HF molecule and explain why F_2 is diamagnetic and O_2 is paramagnetic. (CO1)

OR

- b. Discuss the hydrogen bonding with its classifications and significances. Explain why H_2O is liquid while H_2S is gas at room temperature. (CO1)

Q2.

(10 Marks)

- a. Discuss the following in detail (i) Metallic Bonding (ii) Nanomaterials (CO1)

OR

- b. Describe the principle and applications of UV-Visible Spectroscopy for quantitative and qualitative analysis. (CO1)

Q3.

(10 Marks)

- a. Draw the MOT diagram of O_2 molecule. Arrange O_2 , O_2^+ , O_2^- in increasing order of stability. (CO1)

OR

- b. Discuss Ion-Exchange method for water treatment, incorporating a diagram to illustrate the process. Additionally, assess the regeneration procedure of Ion Exchange columns. (CO2)

Q4.

(10 Marks)

- a. Describe the Zeolite process for softening water and discuss its advantages and disadvantages. (CO2)

OR

- b. Write a short note on (i) Scale and Sludge Formation (ii) hardness in terms of $CaCO_3$ equivalents. (CO2)

Q5.

(10 Marks)

- a. Describe the Lime-Soda method for water softening by explaining the chemical reactions involved in the process. (CO2)

OR

- b. A water sample on analysis have following impurities - $Ca(HCO_3)_2 = 16.2$ ppm; $Mg(HCO_3)_2 = 14.6$ ppm; $CaSO_4 = 13.6$ ppm; $MgCl_2 = 95.0$ ppm, $NaCl = 16.5$ ppm. Calculate the temporary and permanent hardness of water. (CO2)