14/12/21

Roll No. .....

# TCH–101

## B. TECH. (FIRST SEMESTER)

## MID SEMESTER EXAMINATION, NOV., 2021

**(All Branches)**

ENGINEERING CHEMISTRY

**Time : 1½ 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) State the principle for Lime-Soda process. Explain with the help of reactions how the hardness producing salts of bicarbonates, chlorides and sulfates of calcium and magnesium are removed from hard water sample by this method (Lime-Soda). 10 Marks (CO2)

OR

(b) The hardness of 50000 litres of sample water was removed by passing it through a Zeolite softener. The softener than required 200 litres of NaCl solution containing 12.5 g/l of NaCl. Calculate the the hardness of sample water. 10 Marks (CO2)

*P. T. O.*

2. (a) Explain the magnetic properties of NO with molecular orbital diagram. Outline the classification of nanomaterials. 10 Marks (CO1)

OR

(b) Discuss the principle of UV-Vis spectroscopy and state the different electronic transitions. 10 Marks (CO1)

3. (a) The bond length of $CO^+$ (1.115 Å) is less than that in CO (1.128 Å). Explain with the help of Molecular Orbital Theory. 10 Marks (CO1)

OR

(b) How is the band theory useful for explaining the conducting nature of metals ? 10 Marks (CO1)

4. (a) When 0.80 g of coal was burnt completely in bomb calorimeter, the increase in temp. of 2000 grams of water was 2.5°C. If the water equivalent calorimeter is 2200 g, calculate GCV and NCV of the fuel. Given : %H in fuel = 2.5, Latent heat of condensation of steam = 587 cal. 10 Marks (CO4)

OR

(b) (i) What is the composition of biogas ? State the ambient condition for the formation of biogas. 10 Marks (CO4)

(ii) State the characteristics of a good fuel.

5. (a) Describe the principle of the technique for treatment of hardness in which cation is exchanged by cation and the obtained residual hardness of water sample is 10 ppm. Also explain the limitations of the technique. 10 Marks (CO2)

OR

(b) A sample of water is found to contain the following dissolving salts in milligrams per litre :

$Mg(HCO_3)_2 = 73$, $CaCl_2 = 111$, $Ca(HCO_3)_2 = 162$, $CaSO_4 = 136$ and $MgCl_2 = 95$, $NaCl = 100$.

Calculate temporary and permanent hardness and total hardness in ppm and degree clark. 10 Marks (CO2)