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**SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA**

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER B.TECH DEGREE EXAMINATION(R), FEBRUARY 2022

Course Code: 20CYT100

Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

1. Write the electrode reactions and the total cell reaction for the following cell.
 $Pt/Fe^{2+}, Fe^{3+} // Ag^+ / Ag$
2. Discuss the principle involved in the potentiometric redox titration.
3. Define the δ scale of chemical shift.
4. How can you distinguish between intermolecular and intramolecular hydrogen bonding by IR spectroscopy?
5. Interpret the decomposition of calcium oxalate using a DTA curve.
6. What is carbon-based nanomaterials. Give examples.
7. What is keto – enol tautomerism? Give an example.
8. What is Kevlar ? Give its structure.
9. A water sample contains 272 mg of $CaSO_4$ per litre. Calculate the hardness in terms of $CaCO_3$ equivalent.
10. What is desalination? What are the advantages and disadvantages of reverse osmosis technique.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) What are ion selective electrodes? Explain the construction and application of glass electrode in pH determination. (10)
- b) What do you mean by cathodic protection? Describe sacrificial anodic protection method to control corrosion. (4)

OR

12. a) Describe the construction and working of Li – ion battery. Explain its advantages. (10)
- b) The EMF of cell $Cd_{(s)} / Cd^{2+}_{(0.01M)} // Cu^{2+}_{(0.5M)} / Cu$ is 0.79V Determine the standard reduction potential of Cd electrode, if the standard electrode potential of copper is 0.34V . (4)

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MODULE II

13. a) What is spin-spin splitting in NMR spectroscopy. Give the number of signals, multiplicity of different sets of protons in 1-bromopropane. (10)
- b) Discuss the vibrational modes of carbon dioxide molecule. Write which of them are IR active and IR inactive giving reasons for it. (4)

OR

14. a) State and explain Beer – Lambert's law. What are the various types of electronic transitions possible in UV – Visible spectroscopy. (9)
- b) Give the applications of UV spectroscopy. (5)

MODULE III

15. a) Explain the principle, instrumentation and procedure involved in thermogravimetric analysis. (10)
- b) What is R_f value? What is its use in chromatography? (4)

OR

16. a) Describe the principle, instrumentation, working and applications of HPLC. (10)
- b) Explain any four applications of nanomaterials in various fields. (4)

MODULE IV

17. a) What is geometrical isomerism? Draw the Cis – Trans isomers of 1,2 dimethyl cyclopropane and 2-butene. (5)
- b) Explain the working of OLED with the help of a neat diagram. What are its applications. (9)

OR

18. a) Explain Enantiomers and Diastereomers with examples. (4)
- b) Describe the preparation and properties of polyaniline. Give its any four applications. (10)

MODULE V

19. a) Explain ion exchange method of water softening with a neat diagram. (9)
- b) Explain the Winkler's method for determining dissolved oxygen content in water. (5)

OR

20. a) Discuss the treatment of municipal water purification for domestic purpose. (8)
- b) 0.5g of CaCO₃ was dissolved in HCl and the solution made up to 500mL with distilled water. 50mL of this solution required 48mL of EDTA solution for titration. 50mL of hard water sample required 15mL of EDTA and after boiling and filtering required 10mL of EDTA solution. Calculate the total, temporary and permanent hardness of the water sample. (6)
