

**Section D**

7. (a) Differentiate between nanoscience and nanotechnology. Discuss the synthesis, properties and applications of graphene. **7.5**
- (b) Briefly discuss applications of nanomaterials in various fields. **7.5**
8. (a) Discuss the synthesis and applications of PVC and bakelite. **7.5**
- (b) Differentiate between natural and synthetic rubbers with examples. **7.5**

**(Compulsory Question)**

9. (a) What is the significance of the BOD and COD of a water sample ?
- (b) What are uses of solar cells ?
- (c) Explain briefly one technique of water softening.
- (d) What is the role of Bragg's equation in XRD ? Explain.
- (e) Define Hooke's law. How the fundamental vibrations depend on the bond strength ?
- (f) What is stress corrosion ?

**Sep-21-00675**

**B. Tech. EXAMINATION, 2021**

Semester II (CBCS)

ENGINEERING CHEMISTRY

CH-101

*Time : 2 Hours*

*Maximum Marks : 60*

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*The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.*

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**Note :** Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. **9** is compulsory.

**Section A**

1. (a) What do you mean by hardness of water ? Explain the complexometric determination of hardness of water. **7.5**

- (b) What are the disadvantages of hard water and scale formation in boilers ? Discuss any *two* techniques to prevent the scale formation in boilers. **7.5**
2. (a) Describe the construction, working and uses of Ni-Cd and lithium-ion batteries. **7.5**
- (b) Derive an equation that describes the relationship between electrode potentials and the concentration of electrolyte solution. Calculate the electrode potential of a zinc electrode dipped in a 0.1 M ZnSO<sub>4</sub> solution at 298 K, assuming ZnSO<sub>4</sub> to be 95% dissociated (The standard electrode potential of Zn<sup>2+</sup>/Zn is given as – 0.76 V at 298 K). **7.5**

### Section B

3. (a) Differentiate between dry and wet corrosion. Discuss the electrochemical theory of corrosion. **7.5**
- (b) Write short notes on the following :
- (i) Galvanic corrosion
- (ii) Sacrificial anodic protection method for controlling corrosion. **7.5**

4. (a) Explain the following terms :
- (i) Auxochrome and chromophore
- (ii) Electronic transitions in UV-visible spectroscopy. **7.5**
- (b) What is the principle of IR spectroscopy ? How can you distinguish between inter- and intra-molecular hydrogen bonding by IR absorption spectra ? **7.5**

### Section C

5. (a) Explain the term octane number. A sample of petrol produces the same knocking as the mixture containing 30% *n*-heptane and 70% *iso*-octane. What is the octane number of the sample ? **7.5**
- (b) Discuss the proximate and ultimate analysis of coal in detail. **7.5**
6. (a) What is the need of lubrication ? Explain the mechanism of lubrication in machines. **7.5**
- (b) Write a short note on cracking and reforming of petroleum fuels. **7.5**

- (g) Differentiate between water and producer gas.
- (h) How the cetane number can be used to check the quality of diesel ?
- (i) What are the conducting and biodegradable polymers ?
- (j) Briefly discuss any *one* method of preparation of nanomaterials. **1.5×10=15**