

16003(J) J-16

B. Tech 2nd Semester Examination

Engineering Chemistry (CBS)

CH-101

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

**Note :** Question No. 9 (Section E) is compulsory. The candidate is required to attempt five questions selecting one question from each section. All questions carry equal marks.

SECTION - A

1. (a) What are the disadvantages of boiler scales? How the scale formation can be prevented by phosphate conditioning and calgon conditioning? (5)
- (b) What are permanent and temporary hardness of water? What are the major disadvantages of using hard water for domestic purposes? (4)
- (c) What are BOD and COD of a water sample? Indicate their significance in sewage treatment. (3)
2. (a) Derive Nernst equation. Calculate the potential of the following electrochemical cell at 25°C:  
 $\text{Cu (s) | Cu}^{2+} \text{ (aq) (0.5 M) || H}^+ \text{ (0.01M) | H}_2 \text{ (0.95 atm); Pt}$   
Given:  $E^\circ_{\text{cathode}} = 0.00 \text{ V}$  and  $E^\circ_{\text{anode}} = 0.34 \text{ V}$  (5)
- (b) Discuss the construction, working and application of hydrogen-oxygen fuel cell. (5)

[P.T.O.]

- (c) Explain the mechanism of power generation by solar cell. (2)

SECTION - B

3. (a) Differentiate between dry and wet corrosion. Discuss sacrificial anodic protection method for controlling corrosion. (5)
  - (b) Write notes on the followings:
    - (i) pitting corrosion.
    - (ii) stress corrosion. (5)
  - (c) Explain with example that how the nature of oxide film formed on a metallic surface affects its rate of corrosion. (2)
  4. (a) Explain the following terms:
    - (i) chromophore.
    - (ii) auxochrome. (3)
  - (b) What are the possible electronic transitions that fall in UV-Vis region? Explain the effect of polar solvents on  $n \rightarrow \pi^*$  electronic transitions. (3)
  - (c) Discuss the basic principle of IR spectroscopy. Explain the effect of hydrogen bonding on the IR stretching frequency. (4)
  - (d) Why broad absorption bands are found in UV-Vis spectrum instead of sharp peaks? (2)
- SECTION - C
5. (a) Explain the mechanism of lubrication used in delicate machines like watches, sewing machine etc. Discuss extreme pressure lubrication. (5)

- (b) Write notes on the followings:
- Saponification number and iodine number.
  - Cloud and pour points.
  - Viscosity and viscosity index.
  - Aniline point. (7)
6. (a) Explain proximate and ultimate analysis of coal and write their significance. (4)
- (b) Write notes on the followings:
- Cracking of petroleum fuels.
  - Octane number.
  - Water gas.
  - Catalytic reforming. (8)

#### SECTION - D

7. (a) Differentiate between thermoplastic and thermosetting polymers with examples. (3)
- (b) What are conducting polymers? How the conductivity of a conducting polymer can be increased? (3)
- (c) Discuss the synthesis and applications of bakelite and polyurethane. (6)
8. (a) Write notes on the followings:
- biodegradable polymers.
  - synthetic rubber.
  - vulcanization of rubber. (6)

[P.T.O.]

- (b) What are nanomaterials? Discuss the preparation, properties and applications of carbon nanotubes. (6)

#### SECTION - E

9. (a) What is the neutralization number of a lubricant?
- (b) Rusting of iron is quicker in saline water than in ordinary water — Why?
- (c) Teflon (PTFE) is an addition polymer, but it behaves somewhat like a thermosetting polymer — Give reason.
- (d) Compare the IR stretching frequency of C—H and C—D bonds with explanation.
- (e) What is cetane number?
- (f) Explain fundamental vibration in IR spectroscopy.
- (g) How many hexagonal and pentagonal faces are present in fullerene?
- (h) Why does corrosion occur in steel pipe connected to copper plumbing?
- (i) Explain why a porous plate or a salt bridge is not required in a lead-acid storage cell?
- (j) Write Bragg's equation and mention the terms involved.
- (k) What is blue shift in UV-Vis absorption spectra?
- (l) What is galvanization? (1×12=12)