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**First Semester B.E. Degree Examination, Dec.2018/Jan.2019**  
**Engineering Chemistry**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

**Module - 1**

- 1
  - a. Define terms : (i) Free energy (ii) Entropy (iii) Cell potential. (06 Marks)
  - b. For the cell,  $\text{Fe} | \text{Fe}^{2+} (0.01\text{M}) || \text{Ag}^+ (0.1\text{M}) | \text{Ag}$ , write the cell reaction and calculate the e.m.f of cell at 298 K, if standard potentials of Fe and Ag electrodes are  $-0.44\text{ V}$  and  $+0.8\text{ V}$  respectively. (07 Marks)
  - c. What are Secondary Batteries? Explain the construction and working of Nickel — metal hydride (Ni - MR) battery. Mention its applications. (07 Marks)

**OR**

- 2
  - a. Define Primary, Secondary and Reserve batteries with examples. (06 Marks)
  - b. What are concentration cells? The cell potential of copper concentration cell  $\text{Cu} | \text{CuSO}_4 (0.005\text{M}) || \text{CuSO}_4 (X) | \text{Cu}$  is  $0.0295\text{ V}$  at  $25^\circ\text{C}$ . Calculate the value of X. (06 Marks)
  - c. Explain the construction and working of glass electrode giving its application in determination of pH of solution. (08 Marks)

**Module - 2**

- 3
  - a. Define corrosion. Describe the electrochemical theory of corrosion taking rusting of iron as an example. (07 Marks)
  - b. Explain (i) Water line corrosion (ii) Pitting corrosion. (06 Marks)
  - c. What is electroless plating? Explain electroless plating of Nickel. (07 Marks)

**OR**

- 4
  - a. What is meant by metal finishing? Mention (any five) technological importance of metal finishing. (06 Marks)
  - b. Explain the process of (i) Galvanizing (ii) Anodising of AC. (07 Marks)
  - c. What is electroplating? Explain electroplating of chromium. Mention why chromium cannot be used as anode. (07 Marks)

**Module - 3**

- 5
  - a. Define calorific value of fuel. Explain the experimental determination of calorific value of solid / liquid fuel using Bomb calorimeter. (08 Marks)
  - b. What are fuel cells? Describe the construction and working of Solid Oxide Fuel Cell (SOFC). (06 Marks)
  - c. What are Solar cells? Explain the construction and working of photovoltaic (PV) cell. (06 Marks)

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OR

- 6 a. Explain the preparation of solar grade Silicon by Union Carbide process. (07 Marks)
- b. Write a note on (i) Power alcohol (ii) Unleaded petrol. (06 Marks)
- c. 0.75 g of coal sample (Carbon 90%, H<sub>2</sub> 5% and ash 5%) was subjected to combustion in Bomb calorimeter. Mass of water taken in calorimeter was 2.5 kg and the water equivalent of calorimeter is 0.65 kg. The rise in temperature was found to be 3.2°C. Calculate higher and lower calorific values of the sample. Latent heat of steam = 2457 kJ/kg and specific heat of water = 4.187 kJ/kg/°C. (07 Marks)

Module-4

- 7 a. What are the causes, effects and disposal methods of e-waste? (07 Marks)
- b. What are the sources, effects and control of lead pollution? (Pb pollution). (07 Marks)
- c. In a COD test, 30.2 cm<sup>3</sup> and 14.5 cm<sup>3</sup> of 0.05 N FAS solutions are required for a Blank and Sample titration respectively. The volume test sample used was 25 cm<sup>3</sup>. Calculate the COD of the sample solution. (06 Marks)

OR

- 8 a. Explain the sources, effects and control of oxides of nitrogen. (07 Marks)
- b. Explain softening of water by ion exchange method. (07 Marks)
- c. Explain the Activated sludge treatment of sewage water. (06 Marks)

Module-5

- a. Explain the theory, instrumentation and application of Atomic absorption spectroscopy. (07 Marks)
- b. Explain the theory and instrumentation of potentiometry. (07 Marks)
- c. Write a note on Fullerene. Mention its application. (06 Marks)

OR

- 10 a. What are Nanomaterials? Explain the synthesis of nanomaterials by precipitation method. (07 Marks)
- b. Explain the synthesis of Nano materials by Sol-Gel technique. (06 Marks)
- c. Explain the theory and instrumentation of conductometry. (07 Marks)