

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN

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Course Code

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First/Second Semester B.E. Degree Examinations, September/October 2022

ENGINEERING CHEMISTRY

(Common to all Branches)

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. Missing data, if any, may be suitably assumed

| Q. No | Question | Marks | (RBTL:CO:PI) |
|-------------------|--|-------|---------------|
| Module - 1 | | | |
| 1 | a Define electrode potential. Derive Nernst's equation for single electrode potential. | 08 | (2:1 : 1.2.1) |
| | b A cell is constructed by dipping zinc electrode in 0.01M Zn ²⁺ and copper electrode in 0.1M Cu ²⁺ solution. Standard electrode potential of Zn and Cu are -0.76 V and 0.34 V respectively. Write cell representation, cell reaction and calculate e.m.f of the cell at 25°C. | 06 | (3:1 : 1.2.1) |
| | c What are secondary batteries? Explain construction and working of Lithium Ion battery. 1.12.95V | 06 | (2:1 : 1.2.1) |
| (OR) | | | |
| 2 | a What are reserve batteries? Explain construction and working of Nickel-Metal Hydride battery. | 08 | (2:1 : 1.2.1) |
| | b A cell is constructed by dipping two copper electrodes in 0.05 M and 0.5 M copper sulphate solution. Write cell representation, cell reaction and calculate e.m.f of the cell at 25°C. 0.0591V 0.0295V | 06 | (3:1 : 1.2.1) |
| | c What are reference electrodes? Explain construction and working of Calomel electrode? | 06 | (2:1 : 1.2.1) |
| Module - 2 | | | |
| 3 | a Define corrosion. Explain electrochemical theory of corrosion taking rusting of iron as an example. | 08 | (2:2 : 1.2.1) |
| | b Explain the following factors affecting the rate of corrosion. (i) Ratio of anodic and cathodic areas (ii) Nature of corrosive products (iii) pH | 06 | (2:2 : 1.2.1) |
| | c Define electroless plating. Explain electroless plating of copper. | 06 | (2:2 : 1.2.1) |
| (OR) | | | |
| 4 | a Define electroplating. Explain electroplating of chromium. | 08 | (2:2 : 1.2.1) |
| | b Distinguish between electroplating and electroless plating. | 06 | (2:2 : 1.2.1) |
| | c Write a note on sacrificial anodic method and impressed current methods of corrosion control. | 06 | (2:2 : 1.2.1) |
| Module-3 | | | |
| 5 | a Define calorific value. Explain determination of calorific value of solid fuels by Bomb calorimeter. | 08 | (2:3 : 1.2.1) |

- b Define Octane number and Cetane number. 06 (2:3 : 1.2.1)
- c Define Solar cells? Explain construction and working of PV- Cell. 06 (2:3 : 1.2.1)

(OR)

- 6 a Explain synthesis of Bio-diesel and give its advantages. 06 (2:3 : 1.2.1)
- b What are fuel cells? Explain construction and working of Methanol – Oxygen fuel cell. 06 (2:3 : 1.2.1)
- c Calculate GCV and NCV from the data: Weight of the fuel taken = 0.95 g, Water equivalent of stirrer, bomb etc., = 550 g, Weight of the water in the calorimeter = 5000 g, Increase in the temperature of the water = 3.5°C, % of hydrogen in the fuel = 5 %, Specific heat of water = 4.187 KJ/Kg/°C, Latent heat of steam = 2454 KJ/Kg. 08 (3:3 : 1.2.1)

HCV = 85613.13

Module-4

L CV = ~~84508.33~~
84508.33

1104.3

- 7 a Define a polymer. Explain free radical mechanism of addition polymerization of ethylene. 06 (2:4 : 1.2.1)
- b Distinguish between Thermoplastic and Thermosetting Polymers. 06 (2:4 : 1.2.1)
- c A polymer sample contains 1, 2, 3 and 4 molecules having molecular weight of 1×10^5 , 3×10^5 , 5×10^5 , and 7×10^5 . Calculate number average and weight average molecular weight of the polymer. 08 (3:4 : 1.2.1)

(OR)

- 8 a Explain preparation, properties and application of Epoxy resin. 06 (2:4 : 1.2.1)
- b What are conducting polymers? Explain doping of polyacetylene. 06 (2:4 : 1.2.1)
- c Explain preparation, properties and application of Kevlar. 08 (2:4 : 1.2.1)

Module-5

- 9 a Explain theory, instrumentation and application of Conductometry. 06 (2:5 : 1.2.1)
- b Explain theory and instrumentation of Colorimetry and explain estimation of copper by colorimetric method. 06 (2:5 : 1.2.1)
- c Calculate temporary and permanent hardness of water containing $\text{Mg}(\text{HCO}_3)_2 = 8.5 \text{ mg/L}$, $\text{Ca}(\text{HCO}_3)_2 = 15.2 \text{ mg/L}$; $\text{MgCl}_2 = 9.5 \text{ mg/L}$; $\text{CaSO}_4 = 12.6 \text{ mg/L}$; (Given: Molecular Weight of $\text{Mg}(\text{HCO}_3)_2 = 146$, $\text{Ca}(\text{HCO}_3)_2 = 162$, $\text{MgCl}_2 = 95$ and $\text{CaSO}_4 = 136$). 08 (3:5 : 1.2.1)

(OR)

- 10 a What is meant by desalination of water? Apply reverse osmosis for desalination of water. 06 (2:5 : 1.2.1)
- b Define COD. 25 ml of industrial waste water require 33.5 ml and 21.0 ml of 0.05 N $\text{K}_2\text{Cr}_2\text{O}_7$ for blank and main titrations respectively. Calculate COD of the waste water. 06 (3:5 : 1.2.1)
- c Explain theory and instrumentation of Potentiometry and explain estimation of FAS. 08 (2:5 : 1.2.1)
