

**BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT**

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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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)
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**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. <span style="color: red;">1.1295V</span>  | 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. <span style="color: red;">0.0591V 0.0295V</span> | 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**

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|---|---|---|----|---------------|
| 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.<br>(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)

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|---|---|---|----|---------------|
| 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**

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|---|---|--|----|---------------|
| 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 = ~~84277.83~~  
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  $1 \times 10^5$ ,  $3 \times 10^5$ ,  $5 \times 10^5$ , and  $7 \times 10^5$ . Calculate number average and weight average molecular weight of the polymer. 08 (3:4 : 1.2.1)

$50 \times 10^5$   
 $58 \times 10^5$

(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)

15.2  
19.26

(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)

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