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P.E.S. College of Engineering, Mandya - 571 401
 (An Autonomous Institution affiliated to VTU, Belagavi)
Second Semester, B.E. - Semester End Examination; May / June - 2019
Engineering Chemistry
 (Common to All Branches)

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: **Aware and recognize** the importance of chemical fuels and alternate fuels.CO2: **Describe** the construction, working and applications of electrodes, cells and batteries.CO3: **Apply the knowledge** of Chemistry to understand the mechanism and prevention of corrosion. Engineering applications of electro-plating and electro-less plating.CO4: **Synthesis** of various polymers and study their applications. Use of cement and lubricants in the field of Engineering. **Acquiring** the knowledge of liquid crystals, nano science, water technology and water pollution.**Note:** Answer **FIVE** full questions, selecting **ONE** full question from each unit.

| Q. No. | Questions | Marks | COs | BL | POs |
|------------------|--|-------|-----|----|-----|
| UNIT - I | | | | | |
| 1 a. | What are chemical fuels? Explain the characteristics of an ideal fuel and mention the advantages of gaseous fuel. | 6 | CO1 | L1 | PO1 |
| b. | Define catalytic cracking. Describe the fluidized catalytic cracking of heavy oil. | 7 | CO1 | L2 | PO1 |
| c. | Differentiate HCV and LCV and evaluate HCV and LCV of gaseous fuel using the following data : | | | | |
| | i) Volume of gaseous fuel is burnt = 0.006 m ³ | | | | |
| | ii) Mass of water circulated = 2000 gms | 7 | CO3 | L3 | PO3 |
| | iii) Raise in temperature = 17.7°C | | | | |
| | iv) Mass of water condensed = 7.7 gms | | | | |
| | v) Specific heat of water = 4.187 kJ/kg/°C | | | | |
| 2 a. | What is knocking? Explain the mechanism and mention ill effect of knocking. | 6 | CO2 | L2 | PO2 |
| b. | Discuss the reformation of petrol and explain synthetic petrol by Bergius method. | 7 | CO2 | L2 | PO2 |
| c. | Describe the production of solar grade silicon by CZO-Chralski method and purified by zone refiner. | 7 | CO3 | L3 | PO3 |
| UNIT - II | | | | | |
| 3 a. | Explain the construction, working and application of glass electrode. | 6 | CO1 | L1 | PO1 |
| b. | Define standard electrode potential and explain the determination of Pka values of weak acid. | 7 | CO2 | L2 | PO2 |
| c. | Evaluate the EMF of cell, ΔG and ΔG° when Ag and Li electrode are in contact with 0.2 M and 0.02M AgNO ₃ and LiCl solutions respectively at 25°C. Represent the cell and write half cell and net cell reactions. | 7 | CO3 | L3 | PO3 |
| | Given: $E^\circ_{Ag} = 0.80$ V, $E^\circ_{Li} = -3.05$ V. | | | | |

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| 4 a. | Describe the following characteristics of battery : | 6 | CO3 | L2 | PO3 |
| | i) Voltage ii) Capacity iii) Cycle life | | | | |
| b. | Explain the construction, working and applications of lithium ion battery. | 7 | CO1 | L1 | PO1 |
| c. | What are fuel cells? Discuss the construction, working applications of H ₂ -O ₂ fuel cell. | 7 | CO1 | L1 | PO1 |

UNIT - III

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| 5 a. | Illustrate the differential metal corrosion and differential aeration corrosion. | 6 | CO2 | L2 | PO2 |
| b. | What are corrosion Inhibitors? Explain how corrosion is prevented by corrosion Inhibitors? | 7 | CO1 | L1 | PO1 |
| c. | Describe the galvanising and tinnig. | 7 | CO2 | L2 | PO2 |
| 6 a. | What is electro plating? Explain the objectives of electro plating. | 6 | CO1 | L1 | PO1 |
| b. | Discuss the following factors affecting on electro deposit : | 6 | CO2 | L2 | PO2 |
| | i) Current density ii) Throwing power iii) pH | | | | |
| c. | Differentiate electro-plating and electro-less plating and explain the electro-less plating of Cu on PCB. | 8 | CO2 | L2 | PO2 |

UNIT - IV

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| 7 a. | What is Tg? Describe the factors affecting on Tg. | 6 | CO1 | L1 | PO1 |
| b. | How are the following synthesized? | 7 | CO3 | L3 | PO3 |
| | i) Kevlar ii) Poly carbonate iii) Thiokol | | | | |
| c. | What are conducting polymers? Explain the synthesis and mechanism of poly-acetylene. | 7 | CO2 | L2 | PO2 |
| 8 a. | Describe the experimental method of determination of % of CaO in cement solution by rapid EDTA method. | 6 | CO2 | L2 | PO2 |
| b. | Define adhesive. Give the synthesis and application of Araldite (Epoxy resin). | 6 | CO3 | L3 | PO3 |
| c. | Discuss the Vulcanization and compounding of rubber. | 8 | CO2 | L2 | PO2 |

UNIT - V

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| 9 a. | Describe any three types of mesophases of liquid crystals . | 6 | CO1 | L1 | PO1 |
| b. | Explain the following terms : | 7 | CO3 | L2 | PO3 |
| | i) Nano rods ii) Nano tubes and Nano wires | | | | |
| c. | Discuss the bottom up and top down approach of Nano materials . | 7 | CO1 | L1 | PO1 |
| 10 a. | Briefly explain the Ion exchange process of purification of hard water. | 6 | CO2 | L2 | PO2 |
| b. | What is desalination? Describe the reverse osmosis process of desalination of sea water. | 7 | CO1 | L1 | PO1 |
| c. | Describe COD and BOD. 25 ml of effluent sample for COD analysis was reacted with 15 ml of 0.2 N K ₂ Cr ₂ O ₇ solution and after the reaction, the unreacted K ₂ Cr ₂ O ₇ required 19 ml of 0.15 N FAS for reaction. Under identical condition, 15 ml of K ₂ Cr ₂ O ₇ solution mixed with 25 ml of distilled water required 32 ml of 0.15 N FAS. What is the COD of the sample? | 7 | CO3 | L2 | PO3 |