

**P.E.S. College of Engineering, Mandya - 571 401***(An Autonomous Institution affiliated to VTU, Belagavi)***First Semester, B.E. - Semester End Examination; Dec. - 2019****Engineering Chemistry****(Common to All Branches)***Time: 3 hrs**Max. Marks: 100***Note:** i) **PART - A** is compulsory. **Two** marks for each question.ii) **PART - B:** Answer any **Two** sub questions (from a, b, c) for Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks
I : PART - A		10
I a.	Give the classification of chemical fuels.	2
b.	Define standard electrode potential and write Nernst's equation.	2
c.	Mention any four technological importance of metal finishing.	2
d.	Explain the synthesis of polyurethane.	2
e.	What are Thermotropic and Lyotropic liquid crystals?	2
II : PART - B		90
UNIT - I		18
1 a.	Define GCV and NCV of a fuel. Calculate the GCV and NCV of a coal sample from the following data: Weight of coal sample = 0.85 g Weight of the water taken in the calorimeter = 3500 g Water equivalent of calorimeter = 500 g Initial temperature of water = 25°C Final temperature of water = 27.5°C Percentage of hydrogen in the coal sample = 2.5 Specific heat of water = 4.187 kJ/kg/°C Latent heat of steam = 587 cal/g	9
b.	What is cracking? Explain fluidized bed catalytic cracking. Give any three reformation reactions of petroleum fractions.	9
c.	What is photovoltaic cell? Illustrate the working of PV cell with applications.	9
UNIT - II		18
2 a.	What are the limitations of primary reference electrode? Explain the construction, working and applications of calomel electrode.	9
b.	Discuss the construction and working of Lithium-ion battery. Estimate the emf of a cell, When Zinc and silver electrodes are in contact with 0.005 M and 0.1 M ZnSO ₄ and AgNO ₃ solutions respectively at 298 K. Write the cell representation. Half-cell and Net-cell reactions. Given; $E_{Zn}^0 = -0.76 V$ and $E_{Ag}^0 = +0.80 V$.	9
c.	Discuss capacity and energy efficiency of a battery. Explain the construction and working of H ₂ -O ₂ fuel cell.	9

UNIT - III**18**

- 3 a. Define corrosion. Explain electrochemical theory of corrosion with reference to Iron. What is the effect of pH and temperature on rate of corrosion? 9
- b. Discuss the following corrosion control methods : 9
- i) Cathodic protection by sacrificial anode method 9
- ii) Galvanization
- c. Distinguish between electroplating and electro-less plating. Explain the following factors affecting the nature of electro-deposit; 9
- i) Current density ii) Levelers iii) Throwing power

UNIT - IV**18**

- 4 a. Discuss the synthesis and applications of the following polymers: 9
- i) Butyl rubber ii) Epoxy resin iii) Kevlar
- b. What are conducting polymers? Explain the synthesis of conducting poly acetylene by P-doping. Justify the process of Vulcanization of rubber. 9
- c. Illustrate the quality and soundness of cement. Explain the following properties of lubricants: 9
- i) Viscosity ii) Pour point and Cloud point iii) Oiliness

UNIT - V**18**

- 5 a. Summarize the following: 6
- i) Nano-rod, Nano-tubes and Nano-wires 6
- ii) Justify the application of liquid crystals in thermo-graphy 3
- b. What are boiler scales? Explain their ill effects. Illustrate the desalination of seawater by reverse osmosis. 9
- c. Explain the determination of COD of industrial wastewater. Evaluate COD of the effluent, if 30 ml of an effluent sample required 9.8 ml of 0.001 $\text{MK}_2\text{Cr}_2\text{O}_7$ solution for oxidation. 9

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