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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 - 2018

Engineering Chemistry

(Common to all Branches)

Time: 3 hrs

Max. Marks: 100

Note: i) Answer FIVE full questions, selecting ONE full question from each unit.

ii) Assume suitably missing data if any.

UNIT - I

- 1 a. Elaborate on the experimental determination of calorific value of a solid fuel using Bomb calorimeter. 7
- b. Justify the need of reformation of petrol. Write any three reactions during reformation. 7
- c. With the help of phase diagram of Pb-Ag system, explain desilverisation of lead by Pattinson's process. 6
- 2 a. Explain the fluidized bed catalytic cracking. Mention its advantages. 7
- b. Explain the Phase diagram of water system. 7
- c. Define Phase rule. Explain the terms involved. 6

UNIT - II

- 3 a. Derive Nernst equation for electrode potential. 6
- b. What are ion-selective electrodes? Explain the determination of pH of a solution using glass electrode and mention its advantages. 8
- c. Describe the construction and working of Nickel-Metal hydride battery. 6
- 4 a. Explain the construction and working of calomel electrode. 6
- b. An electrochemical cell is constructed by placing Ni electrode in 0.01 M, Ni^{2+} solution and Pb electrode in 0.5M Pb^{2+} solution. The SRP of Ni and Pb are - 0.24 V and - 0.13 V respectively. Write the cell representation, cell reactions and calculate the emf of the cell. 6
- c. Discuss the construction and working of Lithium ion battery with reactions involved during discharge. 4
- d. Explain the following characteristics of a battery : 4
- i) Energy efficiency ii) Capacity

UNIT - III

- 5 a. Define Corrosion and explain the Corrosion of iron based on electrochemical theory. 7
- b. Discuss the effect of : 6
- i) Area of cathode to anode
- ii) Nature of corrosion product
- iii) pH on the rate of corrosion

Contd....2

- c. What is electroless plating? Discuss electroless plating of copper for PCB. 7
- 6 a. What is Cathodic Protection? Explain sacrificial anode method. 6
- b. Explain electroplating of chromium by sulphate method. 7
- c. Outline the process of Galvanizing and tinning. 7

UNIT - IV

- 7 a. Define Tg. Explain any three factors that influence Tg of a polymer. 8
- b. What is meant by vulcanization? Explain the changes that occur upon vulcanization in elastomers. 6
- c. Discuss the following properties of cement :
- i) Quality 6
- ii) Soundness
- iii) Shrinkage
- 8 a. Explain the following properties of lubricants :
- i) Flash point ii) Viscosity index 8
- iii) Cloud point iv) Coke point
- b. Write reactions of preparation of epoxy resin. Mention its applications. 6
- c. Give the synthesis and applications of :
- i) Poly carbonate 6
- ii) Butyl rubber

UNIT - V

- 9 a. What are Liquid crystals? Distinguish between Thermo-Tropic and Lyo-Tropic liquid crystals with examples. Mention its applications. 7
- b. What is the significance of measurement of COD? Explain the determination of COD in the laboratory. 6
- c. What are nanoparticles? Mention any two properties of them and their applications. 7
- 10 a. Explain desalination by reverse osmosis with principle. Mention two advantages of RO process. 7
- b. What are boiler scales? Discuss their formation and ill effect. 7
- c. Define COD and BOD. Calculate the COD of effluent sample, when 25 ml of an effluent requires 8.9 ml of 0.02M $K_2Cr_2O_7$ for complete oxidation. 6

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