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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; Dec - 2017/Jan - 2018

Engineering Chemistry

(Common to all Branches)

Time: 3 hrs *Max. Marks: 100*

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

UNIT - I

1 a.	Define GCV and NCV. Illustrate the determination of calorific value of gaseous fuel using Buoy's calorimetric method.	7
b.	What is knocking? Outline its ill effects and explain the prevention of knocking by leaded and unleaded petrol.	7
c.	Evaluate the GCV and NCV of a solid fuel using the following data :	6

i) Mass of fuel taken = 5×10^{-3} kg   ii) Mass of water taken = 2.5 kg

iii) Water equivalent of calorimeter = 0.7 kg   iv) Raise in temperature = 4.7ºC

v) % of H_2 in a fuel = 3.7%   vi) Latent heat of steam = 587 kcal / kg

vii) Specific heat of water = 4.187 kJ/kg/ºC.

2 a.	State Phase rule. Explain the terms involved in it with example.	7
b.	Draw and illustrate the phase diagram of two component system.	7
c.	Define Octane number and Cetane number. Outline the reformation of petrol.	6

UNIT - II

3 a.	Explain the construction, working and applications of Z_n-Ag_2O battery.	7
b.	Outline the limitations of primary reference electrode. Explain the construction and working of calomel electrode.	7
c.	A cell is formed by dipping nickel rod in 0.01 M Ni^{2+} solution and lead rod in 0.5 M Pb^{2+} solutions. The standard electrode potentials of Ni and Pb are -0.24 V and -0.13 V respectively. Write the cell representation, half cell and net cell reaction and estimate the emf of cell.	6
4 a.	Characterize the following properties of battery :	7

i) Capacity   ii) Energy efficiency

iii) Cycle life   iv) Shelf life.

b.	Explain the construction, working and applications of Nickel-Metal hydride battery.	7
c.	Demonstrate the construction, working and applications of H_2-O_2 fuel cell.	6

UNIT - III

5 a.	Define corrosion. Discuss the electrochemical theory of corrosion.	7

b. Outline the following factors affecting the rate of corrosion :

    i) Nature of metal   ii) Anodic and cathodic areas   7

    iii) pH   iv) Temperature.

c. Explain the corrosion prevention by corrosion inhibitors.   6

6 a. Examine the electroplating of chromium by sulphate method.   7

b. Outline the advantages of electroless plating and demonstrate the electroless palting of copper on PCB.   7

c. What is stress corrosion? Discuss the caustic embritlement in boilers.   6

UNIT - IV

7 a. What is glass transition temperature (Tg)? Outline the factors affecting on Tg and significance of Tg.   7

b. Discuss the synthesis and applications of the following polymers :

    i) PMMA   ii) Poly-urethane   iii) Kevlar.   7

c. Explain the significance of lubricants.   6

8 a. What is conducting polymer? Explain the synthesis and mechanism of conduction in P-doped poly acetylene.   7

b. Define Lubricant. Illustrate the following properties of Lubricant :

    i) Viscosity Index   ii) Cloud point   iii) Pour Point   7

    iv) Flash Point   v) Oiliness.

c. Discuss the synthesis and applications of the following :

    i) Butyl rubber   ii) Epoxy resin.   6

UNIT - V

9 a. What are liquid crystals? Summarize the Nematic and Cholesteric mesophases.   7

b. Justify the applications of liquid crystals in display systems and thermography.   7

c. Discuss the bottom up and top down approach of synthesis of nano particles.   6

10 a. Define boiler scale and sludge. Discuss the prevention of boiler scales by the following internal treatment :

    i) Calgon conditioning   ii) Phosphate conditioning.   7

b. What is desalination? Illustrate the desalination of sea water by electro dialysis.   7

c. Define COD. 25 ml of sewage water reacted with 25 ml of $K_2Cr_2O_7$ solution and unreacted $K_2Cr_2O_7$ requires 8.0 ml of 0.25 N FAS. Blank titration requires 15.0 ml of 0.25 N FAS under similar conditions. Evaluate the COD of sewage water. COD is greater than BOD, justify.   6

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