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

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester, B.E. Make-up Examination; July - 2016

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 Calorific value of a fuel. The data obtained in Buoy's gas calorimeter experiment are as follows: Volume of gas used = 0.05 m^3 , weight of water used = 20 kg, Temperature of inlet water = 20°C , Temperature of outlet water = 30°C , Weight of steam condensed = 0.025 kg. Calculate the GCV and NCV at STP. Latent heat of steam = 580 k cal/kg, specific heat of water = $4.187 \text{ kJ/kg}^\circ\text{C}$. 7
- b. What is knocking? Explain the knocking mechanism and mention its ill effects. 7
- c. Write short notes on : 6
- i) Bio diesel ii) Power alcohol.
- 2 a. Define phase rule. Discuss the following terms with suitable examples : 7
- i) Phase ii) Component iii) Degree of freedom.
- b. What is cracking? How gasoline is obtained from fluidized bed catalytic cracking? 7
- c. Discuss the application of phase rule of lead-silver system. 6

UNIT - II

- 3 a. What are ion selective electrodes? Describe the method of determination of the pH of a given solution using glass electrode. 7
- b. What are fuel cells? Give the construction and working of methanol-oxygen fuel cell. Mention its applications. 7
- c. An electrochemical cell consists of a cadmium electrode dipped in 0.002 M CdSO_4 and copper electrode dipped in $0.02 \text{ M Copper sulphate}$ solution. Write the cell representation. Cell reaction and calculate the emf of the cell at 298 K. Given that, 6
- $(\text{SRP})_{\text{Cd}} = -0.40 \text{ V}$ $(\text{SRP})_{\text{Cu}} = +0.34 \text{ V}$.
- 4 a. Discuss the following characteristics of a battery : 8
- i) Voltage ii) Capacity
- iii) Energy density iv) Energy efficiency.
- b. Describe the construction and working of Calomel electrode. Mention its applications. 6
- c. Briefly explain primary, secondary and concentration cells with suitable example to each. 6

UNIT - III

- 5 a. Define wet corrosion. Explain the electrochemical theory of corrosion with Iron as an example. 7
- b. What is anodizing? Explain the processes of anodizing of aluminium. 7
- c. Discuss the Differential metal corrosion and stress corrosion. 6
- 6 a. What is electroplating? Describe the electroless plating of Copper on PCB. 7
- b. How corrosion can be minimized using proper selection of materials and designing. 7
- c. Discuss the role of the following factors on the nature of electro deposit : 6
- i) Current density ii) Brightners iii) pH.

UNIT - IV

- 7 a. What are Engineering plastics? Give the synthesis and applications of, 7
- i) Polyurathane ii) Cellulose nitrate.
- b. Discuss the following properties of cement : 7
- i) Quality ii) Shrinkage
- iii) Soundness iv) Colour.
- c. Define lubricants. Mention the functions of lubricants. 6
- 8 a. What is vulcanization of rubber? Explain the compounding of rubber. 7
- b. What are conducting polymer? Give the synthesis and applications of poly aniline. 7
- c. What are adhesives? Describe the synthesis and applications of Araldite. 6

UNIT - V

- 9 a. What are liquid crystals? Explain the molecular ordering of, 7
- i) Nematic phase
- ii) Chiral nematic phase
- iii) Smectic phase.
- b. What is boiler scale? How are they formed? Mention the ill effects of boiler scales. 7
- c. Write a short notes on : 6
- i) Nano rod
- ii) Nano tube.
- 10 a. Discuss the purification of water for municipal supply. 8
- b. What is water pollution? Explain the sources of water pollution. Mention the prevention of water pollution. 6
- c. Define COD. Why COD values are greater than BOD? In COD experiment 30.0 cm³ and 16.0 cm³ of 0.025 N FAS required for blank and back titrations. The volume of test sample used is 25 cm³. Calculate COD. 6