



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

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, B.E., - Semester End Examination; Dec - 2016/Jan - 2017

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. Describe the Bergius method for preparation of Synthetic petrol. 7
- b. Distinguish between gross and net calorific values. Give the classification of chemical fuels on the basis of their occurrence, with suitable examples. 5
- c. Explain the concept and mechanism of knocking with respect to IC engine. Explain the preventive action of knocking. 8
- 2 a. Discuss the application of phase rule to a single component system with a labeled diagram. 7
- b. Define the following : 6
 - i) Phase rule ii) Octane number iii) Power alcohol.
- c. Discuss Pattinson's process of desilverisation of lead. 7

UNIT - II

- 3 a. Define single electrode potential. Derive the Nernst's equation for electrode potential. 6
- b. Give cell representation and electrode reactions for an electrochemical cell consisting of copper rod and iron rod dipped in 0.1 M and 0.2 M solutions containing respective metal ions, which are connected by using a salt bridge. [E° for copper and iron electrodes are 0.34 V and - 0.44 V respectively]. 6
- c. Emphasis on classification of batteries. Outline the construction, working and applications of Zn-air battery. 8
- 4 a. Explain the need for the development of secondary reference electrodes. Give the construction and working of calomel electrode. 7
- b. Discuss the following battery characteristics : 8
 - i) Energy efficiency ii) Capacity
 - iii) Cycle life iv) Voltage.
- c. Differentiate between battery and a fuel cell. Explain the construction and working of methanol-oxygen fuel cell. 5

UNIT - III

- 5 a. Write a note on "Corrosion inhibitors". 6
- b. Explain the stress corrosion with a suitable example. 7

- c. Discuss the effect of following factors on the rate of corrosion:
- i) Anodic and Cathodic area ii) Nature of the corrosion product 7
 iii) Temperature iv) pH
6. a. Distinguish between electroplating and electro less plating. Give the both composition and reactions for electro less plating of copper on PCB. 8
- b. Mention the technological importance of metal finishing and explain the electroplating of gold by cyanide process. 8
- c. Account for the following :
- i) Steel pipe connected to copper plumbing suffers from corrosion. 4
 ii) When a part of the iron metal covered by a water drops leads to corrosion?

UNIT - IV

- 7 a. Explain the following properties of cement :
- i) Soundness ii) Setting time iii) Shrinkage. 6
- b. Apply a suitable polymerisation technique to prepare polycarbonate and give its applications. Mention the disadvantages of plastics. 8
- c. Give the synthesis and applications of poly aniline. 6
- 8 a. Give the synthesis and applications of Araldite (Epoxy resins). 6
- b. Describe the following properties of a lubricant :
- i) Viscosity ii) Volatility iii) Pour point iv) flash point. 8
- c. Write a note on vulcanisation of rubber. 6

UNIT - V

- 9 a. Give the classification of liquid crystals with examples and mention the differences between them. 7
- b. Define COD of sewage. Give the functions of silver sulphate and mercuric sulphate used in the determination of COD. Evaluate COD of a waste water sample when 20 ml of waste water sample mixed with 25 ml of $K_2Cr_2O_7$ and refluxed. Un-reacted $K_2Cr_2O_7$ required 9 ml of 0.25 N FAS solution and under similar conditions 15.8 ml of the same FAS solution required for blank titration. 7
- c. Out line the desalination of water by Electro-dialysis. Explain any one ill effect due to boiler scales. 6
- 10 a. Explain Nano rod and Nano wires with examples. 6
- b. Discuss the types of meso phases in liquid crystals. 8
- c. Distinguish between molecules, Nano particles of bulk materials. 6