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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^o 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

Contd…2

c. Discuss the effect of following factors on the rate of corrosion:
i) Anodic and Cathodic area ii) Nature of the corrosion product
iii) Temperature iv) pH — 7

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

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