[4456] - 103
F.E. (Semester - I & II)
ENGINEERING CHEMISTRY
(2012 Course)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) *Answer Q.1 or Q. 2, Q.3 or Q. 4, Q.5 or Q. 6, Q.7 or Q. 8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

Q1) a) Explain formation of scales in boiler, give their disadvantages and methods of removal. **[6]**

b) Calculate potential on redox electrode dipped in titration mixture, when 20 ml of 0.1 N Ce^{4+} solution from the burette is added in 100 ml 0.1 N Fe^{2+} solution. Standard reduction potentials for $Fe^{3+} \dashrightarrow Fe^{2+}$ and $Ce^{4+} \dashrightarrow Ce^{3+}$ are 0.75 V and 1.45 V respectively. **[3]**

c) Explain the conductometric titration of KCl against $AgNO_3$ solution from burette. **[3]**

OR

Q2) a) Explain the principle, instrumentation and applications of UV-Visible spectrophotometer. **[6]**

b) State the problems in traditional synthesis route and advantages of green route in manufacture of adipic acid. **[3]**

c) A zeolite softner gets exhausted on softening 4000 litres of hard water. Calculate hardness of the water if the exhausted zeolite requires 10 litres of 10% NaCl solution for regeneration. **[3]**

Q3) a) i) Give structural change on vulcanization of natural rubber molecules with sulphur. How does it affect the strength? **[3]**

ii) State the purpose of compounding polymers with plasticizers and fillers. **[3]**

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b)   i)   Give the reaction involved in biodiesel formation and state any three advantages of biodiesel. **[3]**

      ii)   Calculate the amount of air (20% excess) required for complete combustion of 1kg wood if it contains 55% carbon, 8% hydrogen, 5% oxygen and remaining non combustible part. **[3]**

<center>OR</center>

Q4) a)   i)   Define biodegradation of polymers. State favourable structure of polymer for biodegradation. Write structure of biopol(PHBV). **[3]**

      ii)   Give any six differences in thermosoftening and thermosetting polymers. **[3]**

   b)   Give construction, working and calculation for finding gross calorific value of a solid fuel by Bomb calorimeter. **[6]**

Q5) a)   Give industrial methods of manufacturing of hydrogen gas. **[5]**

   b)   Explain structure of diamond, give its properties and applications. **[5]**

   c)   Give preparation, reactions of saline hydrides. **[3]**

<center>OR</center>

Q6) a)   State the difficulties in storage of hydrogen gas. Give its chemical storage in alanates and metal hydrides. **[5]**

   b)   Give preparation, reactions of silane. **[4]**

   c)   Give any one method of preparing carbon nanotubes. State applications of carbon nanotubes. **[4]**

Q7) a)   Give the mechanism of electrochemical corrosion. **[5]**

   b)   Explain 'nature of metal' factors affecting rate of corrosion. **[5]**

   c)   What are types of metallic coatings? Which is prefered? Why? **[3]**

<center>OR</center>

Q8) a)   Give principle, construction and applications of cathodic protection. **[5]**

   b)   Explain 'powder coating' method for corrosion control. **[4]**

   c)   Account on, 'nature of oxide films' on metal surface and its effect on further corrosion. **[4]**

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