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First Semester B. E. Semester End Examination, Dec/Jan 2018-19
APPLIED CHEMISTRY/ENGINEERING CHEMISTRY

Time: 3 Hours   Max. Marks: 100

Instructions: *1.   Questions from Unit II and Unit V are compulsory*
                  2.   Answer any one FULL question from each of the other units

| | **L** | **CO** | **PO** | **M** |

UNIT - I

1 a.   Analyze the effect of temperature on the EMF of the following cell if EMF is calculated at 298 and 290 K. $Fe/Fe^{+2}(0.5M)//Cu^{+2}(0.05M)/Cu$. The standard reduction of Fe and Cu are -0.44 V and 0.34 V respectively. Given: R= 8.314 J/K/mol, F = 96485 C

                                                                  (4)   (1)   (1,3,5)   **(06)**

   b.   What is reference electrode? Derive Nernst equation for single electrode.

                                                                  (3)   (1)   (1,3)   **(06)**

   c.   Differentiate battery and Fuel cell. Write anode and cathode reactions involved in Zn-air and Li-Ion batteries.

                                                                  (3)   (1)   (1,3)   **(08)**

OR

2 a.   Define redox electrode. Explain construction and working of Ag-AgCl electrode.

                                                                  (2)   (1)   (1,3)   **(05)**

   b.   Derive an expression for glass electrode. How Calomel electrode and Glass electrode combination is used to determine pH of a solution?

                                                                  (3)   (1)   (1,5)   **(09)**

   c.   What is photovoltaic cell? Explain construction and working of solar cell.

                                                                  (2)   (1)   (1)   **(06)**

UNIT – II   L   CO   PO   M

3 a.   Electroless plating is one of the convenient methods for manufacturing of double sided printed circuit boards. Explain process of electroless plating of copper in the manufacturing of PCB's. Write any three differences between electroplating and electroless plating.

                                                                  (3)   (2)   (1)   **(10)**

   b.   Identify and explain the type of corrosion that may occur in the following cases.
        (i)   Iron bolt in contact with copper vessel
        (ii)   Partially buried iron pipe

                                                                  (3)   (2)   (3)   **(06)**

   c.   What is cathodic protection? Explain cathodic protection by sacrificial anodic method taking suitable example

                                                                  (2)   (2)   (1)   **(04)**

UNIT - III   L   CO   PO   M

4 a.   Differentiate GCV and NCV. Explain determination of Gross calorific value of a solid fuel by Bomb calorimeter.

                                                                  (3)   (3)   (1,3)   **(07)**

   b.   Define cracking. Explain the fluidized bed catalytic cracking process with neat labeled diagram

                                                                  (2)   (3)   (1,3)   **(07)**

   c.   Identify ill effects of knocking. Give instrumentation and applications of UV-Visible spectrophotometer.

                                                                  (3)   (3)   (1,3)   **(06)**

OR

5 a. In a bomb calorimeter determination, on burning 0.75 g of standard fuel of known Gross calorific value (26400 kJ/kg), temperature of 2000 g of water in the calorimeter rose from 26 to 27.4 degrees. In the same calorimeter, when 0.60g of coal sample is burnt, the rise in the temperature of 2000 g of water observed is 2.0 degrees. Calculate GCV of coal sample. Specific heat of water is 4.187 kJ/kg/K, Latent heat of steam is 587 kcal/g

(3)   (3)   (1,3,5)   **(07)**

b. Identify advantages of power alcohol. Explain catalytic reforming with at least four reactions involved in it.

(3)   (3)   (1,3)   **(07)**

c. What is octane number? Explain instrumentation of flame photometer and give its applications

(2)   (3)   (1,12)   **(06)**

UNIT - IV

L	CO	PO	M

6 a. What is glass transition temperature? Explain how the fallowing factors affect glass transition temperature with suitable examples.
   - (i)   Intermolecular force of attraction
   - (ii)   Branching and cross linking
   - (iii) Stereo-regularity.
   - (iv)   Flexibility

(2)   (4)   (1,3)   **(10)**

b. A sample of polymer contains 10, 20, 30 and 40% of molecules of the polymer with molecular weights 10000, 12000, 14000 and 16000. Compute the number average and weight average molecular weight.

(3)   (4)   (1,5)   **(06)**

c. How carbon fibers are synthesized from PAN?

(2)   (4)   (1,3)   **(04)**

OR

7 a. What are bio-degradable plastics? Write the synthesis of polylactic acid. Mention any three applications of PLA.

(2)   (4)   (1,3)   **(07)**

b. What are conducting polymers? Mention any two requirements of conducting polymers. Write the structure of conducting polyaniline

(2)   (4)   (1,5)   **(06)**

c. Write the reactions involved in the synthesis of silicone rubber, epoxy resin and mention any two properties and applications.

(2)   (4)   (1,3)   **(07)**

UNIT -V

L	CO	PO	M

8 a. Differentiate between COD and BOD.
   35 ml of waste water was diluted to 600 ml and equal volumes are filled in two BOD bottles. In the blank titration 50 ml of diluted waste water when titrated immediately required 3.0 ml of 0.05 N $Na_2S_2O_3$. 50 ml of the incubated sample after 5 days required 1.5 ml of same 0.05 N $Na_2S_2O_3$. Calculate BOD of the waste water.

(3)   (5)   (1,3,5)   **(05)**

b. Explain activated sludge method and rotating biological contactor method.

(2)   (5)   (1,5)   **(08)**

c. Explain synthesis of nanoparticles by inert gas method. 25 ml of an Industrial sewage has consumed 10.0 ml of 0.25M $K_2Cr_2O_7$ solution for complete oxidation. Calculate COD of industrial sewage.

(3)   (5,6)   (1,3,5)   **(07)**

First Semester B.E. Makeup Examination, January 2019
APPLIED CHEMISTRY

Time: 3 Hours   Max. Marks: 100

Instructions: *1.*   *Questions from Unit II and Unit V are compulsory*
                  2.   *Answer any one FULL question from each of the other units*

| | | | | | UNIT - I | L | CO | PO | M |

1 a. What are reference electrodes? Discuss the construction and working of Calomel electrode with a neat labeled diagram.

                                                          (2)   (1)   (1,3)   **(06)**

b. What are primary and secondary batteries? Describe the construction and working of Nickel metal hydride battery.

                                                          (2)   (1)   (1,3)   **(06)**

c. Explain the design of PV module and array. Calculate the emf of Ni-Pb cell at 298 K, if the concentrations of Ni^{2+} and Pb^{2+} are 0.05M and 0.5M respectively. The standard electrode potentials of Ni and Pb are -0.24 V and -0.13 V respectively. Write the cell representation and cell reaction.

                                                          (3)   (1)   (1,3,5)   **(08)**

OR

2 a. What are the differences between Li-ion and Li-ion polymer battery? Discuss the construction and working of a Photo Voltaic cell.

                                                          (2)   (1)   (1,3)   **(06)**

b. Define the term Electrode potential and derive an equation for single electrode potential.

                                                          (2)   (1)   (1,3)   **(06)**

c. List out the different types of Fuel cells based on electrolyte. Describe the construction and working of polymer electrolyte membrane fuel cell.

                                                          (2)   (1)   (1,3)   **(08)**

| | | | | | UNIT – II | L | CO | PO | M |

3 a. Explain effect of nature of the corrosion product on the rate of corrosion.
A thick steel sheet of area 250 cm^2 is exposed to air near ocean. After one year period it was found to experience a weight loss of 210 g due to corrosion. The density of steel is 7.9 g/cc. Calculate corrosion penetration rate.

                                                          (3)   (2)   (1,3,5)   **(05)**

b. Identify and explain the types of corrosion occurring in the following examples with reactions;
   i.   Iron nail partially hammered inside the concrete wall,
   ii.   A dust particle sitting on the smooth metal surface

                                                          (3)   (2)   (1,3)   **(08)**

c. What is throwing power? Calculate the throwing power of plating bath solution in a Haring-Blum cell, if the distances between the two cathodes are 5.5 cm and 7.3 cm from the anode and the masses of the plating on the cathodes are 62 mg and 58 mg respectively.

                                                          (3)   (2)   (1,3,5)   **(07)**

| | | | | | UNIT - III | L | CO | PO | M |

4 a. What is knocking in IC engines? Explain the mechanism of knocking in petrol engine with suitable reactions. Mention its disadvantages.

                                                          (2)   (3)   (1,3)   **(06)**

b. Describe the instrumentation and applications of UV-visible spectroscopy with a neat labeled diagram.

                                                          (2)   (3)   (1,3)   **(06)**

Note: L (Level),CO (Course Outcome), PO (Programme Outcome), M (Marks)

c. Define the terms cracking and reforming. Calculate the GCV and NCV of a solid fuel from the following data:

Mass of solid fuel = 0.6×10^{-3} kg; Mass of water in the calorimeter = 2.0 kg;
Water equivalent of calorimeter = 400 g; Rise in temperature = 3°C;
Specific heat of water = 4.187 kJ/kg/$^{\circ}$C; Latent heat of water = 587 cal/g;
Percentage of Hydrogen = 3.2%;

(3)　(3)　(1,3,5)　**(08)**

OR

5 a. Explain the following reforming reactions;
i) Isomerization　　ii) Dehydrocyclization　　iii) Hydrocracking

(2)　(3)　(1,3)　**(06)**

b. What is Biodiesel? Explain the synthesis and advantages of Biodiesel.

(2)　(3)　(1,3)　**(06)**

c. Write a short note on:
i) Octane Number and Cetane Number　　ii) Power alcohol

(2)　(3)　(1,3)　**(08)**

UNIT - IV
L　CO　PO　M

6 a. What are conducting polymers? A sample of polymer contains 15, 25, 35 and 25% of molecules of the polymer with molecular weights 15000, 25000, 35000 and 45000. Calculate the number average and weight average molecular weight of the polymer.

(3)　(4)　(1,3,5)　**(07)**

b. Give synthesis and applications of ABS, polycarbonate and plexiglass

(2)　(4)　(1,3)　**(09)**

c. Define polymer composite. Give synthesis and applications of Kevlar fiber.

(2)　(4)　(1,3)　**(04)**

OR

7 a. What is photoconducting polymer? Give synthesis, properties and applications of polyvinyl carbozole.

(2)　(4)　(1,5)　**(05)**

b. What is glass transition temperature, Tg? Explain the effect of flexibility, Intermolecular force and molecular weight on Tg.

(2)　(4)　(1,3)　**(07)**

c. Give synthesis, properties and applications of epoxy resin and polyurethane.

(2)　(4)　(1,5)　**(08)**

UNIT -V
L　CO　PO　M

8 a. Mention the membrane filtration methods with their pore sizes and calculate COD of a sewage sample when 30 ml of sewage requires 8.6 ml of 0.05 M $K_2Cr_2O_7$ solution for oxidation. Given: Molecular weight of $K_2Cr_2O_7$ is 294.

(3)　(5)　(1,3,5)　**(06)**

b. What are nano scale materials? Describe the synthesis of nano scale materials by inert gas condensation method.

(2)　(5)　(1,3)　**(06)**

c. Explain the following with neat diagram:
i) Activated sludge method　　ii) Desalination by electrodialysis method

(2)　(5)　(1,3)　**(08)**

Note: L (Level),CO (Course Outcome), PO (Programme Outcome), M (Marks)

Second Semester B.E. Semester End Examination, May/June 2018-19
ENGINEERING CHEMISTRY / APPLIED CHEMISTRY
Time: 3 Hours   **Max. Marks: 100**

Instructions: *1.   Answer compulsorily to the questions from Unit I and Unit V*
                      2.   Answer any one full question each from Unit II, III and IV

			L	**CO**	**PO**	**M**

UNIT – I (Compulsory)

1   a.   What are reserve batteries? Describe the construction and working of Calomel electrode.
                                                                             (2)   **(1)**   **(1,3)**   **(06)**

     b.   What are ion selective electrodes? Write the cell representation, cell reaction and calculate the cell potential at 298K for the cell containing copper plate immersed in 1×10^{-2} M Cu^{++} solution and a silver plate immersed in 1×10^{-1} M Ag^+ solution. Given $E^o_{Cu++} = 0.34V$ and $E^o_{Ag+} = 0.80V$.
                                                                  (3)   **(1)**   **(1,3,5)**   **(06)**

     c.   How to arrange the Solar cells into modules, panels and arrays? Discuss the construction and working of Polymer Electrolyte Membrane fuel cell with a neat diagram.
                                                                     (3)   **(1)**   **(1,3)**   **(08)**

UNIT – II
                                                                  L   **CO**   **PO**   **M**

2   a.   Draw a diagram illustrating the formation of galvanic cells on iron surface during rusting in wet aerated, neutral and acidic environment. Discuss the theory behind rusting with the help of possible anode and cathodic reactions.
                                                                   (2)   **(2)**   **(1)**   **(10)**

     b.   Identify and explain the type of corrosion that may occur in the following cases.
        (i)   Iron plate in contact with copper plate and exposed to environment.
        (ii)   Partially buried iron pipe
                                                                   (2)   **(2)**   **(3)**   **(06)**

     c.   What are metallic coatings ? Explain Galvanizing process
                                                                    (2)   **(2)**   **(1)**   **(04)**

OR

3   a.   Explain process of electroless plating of copper in the manufacturing of PCB's. Write any three differences between electroplating and electroless plating.
                                                                    (2)   **(2)**   **(1)**   **(10)**

     b.   How the fallowing factors influence nature of electro-deposit
        (i)   pH of the bath   (ii) Current density   (iii) Throwing power
                                                                    (2)   **(2)**   **(3)**   **(06)**

     c.   Inorganic coatings are superior over organic coatings. Justify the statement. Explain anodizing of aluminium.
                                                                     (3)   **(2)**   **(1)**   **(04)**

UNIT - III

4   a.   What is cracking? Explain fluidized bed catalytic cracking with a neat labeled diagram. Give the significance of regeneration of catalyst.
                                                                    (2)   **(3)**   **(1,3)**   **(06)**

     b.   Give the instrumentation and applications of Flame photometry.
                                                                     (2)   **(3)**   **(1,12)**   **(06)**

     c.   Define GCV and NCV. A solid fuel weighing 0.8×10^{-3} kg and having the composition 85% C,   8% H_2, 1% Sulphur, 2% N_2 and 4% ash gave the following results in a bomb calorimeter experiment. Mass of water in calorimeter = 2.5 kg ; Water equivalent of calorimeter = 0.7 kg ; Rise in temperature = 2.48^oC ; Specific heat of water(s) = 4.187 KJ/kg/^{o}C ; Calculate GCV and NCV.
                                                                    (3)   **(3)**   **(1,3)**   **(08)**

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

5 a. What is knocking in IC engines? Explain its chemical mechanism in IC engines with ill effects.

(2)   (3)   (1)   (06)

  b. List the applications of UV-Visible spectroscopy and explain the following with reforming reactions: a) Isomerization b) Dehydrogenation c) Dehydrocyclization and d) Hydrocracking.

(2)   (3)   (1,5)   (06)

  c. Define the terms Octane number, Cetane number and Power alcohol. Explain the synthesis of Biodiesel with advantages and disadvantages.

(2)   (3)   (1,3)   (08)

UNIT - IV

6 a. A polymer sample contains 10, 20, 30 and 40% of molecules of the polymer with molecular weights 10×10^3, 20×10^3, 30×10^3 and 40×10^3 respectively. Calculate the number average and weight average molecular weight of the polymer.

(3)   (4)   (1,3)   (06)

  b. What are conducting polymers? Explain the synthesis and applications of a biodegradable polylactic acid.

(2)   (4)   (1,3)   (06)

  c. What is glass transition temperature? Explain any three factors influencing glass transition temperature? Give its significance.

(2)   (4)   (1)   (08)

OR

7 a. Define an adhesive. Explain the synthesis and applications of epoxy resin.

(2)   (4)   (1,3)   (06)

  b. What are composite materials? Explain the synthesis and applications of Kevlar fibre.

(2)   (4)   (1,3)   (06)

  c. Give the synthesis and properties of Nomex and Silicone rubber.

(2)   (4)   (1,3,12)   (08)

UNIT –V (Compulsory)

8 a. A sewage sample of 30ml was diluted to 500ml and equal volumes were filled in two BOD bottles. About 50 ml of one of the sample was titrated immediately and it required 8.0 ml of 0.025N $Na_2S_2O_3$ solution. The second sample was incubated for 5 days and it required 3.5 ml of the same $Na_2S_2O_3$ solution for titration. Calculate the BOD of the sewage sample.

(3)   (5)   (1,3)   (06)

  b. What is Desalination? Explain the desalination of water by Electrodialysis method with a neat sketch.

(2)   (5)   (1,5)   (06)

  c. Discuss in brief the synthesis of nanoscale materials by sol-gel and inert gas condensation methods.

(2)   (4)   (1,5)   (08)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

Second Semester B.E. Makeup Examination, May/June 2018-19
APPLIED CHEMISTRY

Time: 3 Hours   **Max. Marks: 100**

Instructions: 1.   *Answer compulsorily Unit I and Unit V questions*
                       2.   *Answer any one full question each from Unit II, Unit III and Unit IV*

UNIT – I (Compulsory)   L   CO   PO   M

1   a.   What are ion selective electrodes? Explain the construction of glass electrode and derive an equation for glass electrode potential.

                                                            (2)   **(1)**   **(1,3)**   **(07)**

    b.   Identify the active cathodic materials used in lithium ion batteries, nickel metal hydride batteries and Zinc-air cell. Calculate the cell potential of Zn-Cu cell at 298 K if the concentration of Zn^{+2} and Cu^{+2} are 0.5M and 0.05M respectively and $E^0_{Zn^{+2}/Zn}$ is -0.76V and $E^0_{Cu^{+2}/Cu}$ is 0.34V. What happens to the cell potential, if the concentration of Zn^{+2} is doubled? Analyze the results.

                                                            (4)   **(1)**   **(1,3)**   **(08)**

    c.   Explain the construction and working of photovoltaic cell.

                                                            (2)   **(1)**   **(1,5)**   **(05)**

UNIT – II   L   CO   PO   M

2   a.   Discuss the electrochemical theory of corrosion taking iron as an example with relevant reactions.

                                                            (2)   **(2)**   **(1)**   **(06)**

    b.   Explain the effect of nature of metal and corrosion product on the rate of corrosion. A piece of steel having area 150cm^2 is exposed to a corrosion medium. After 3 years it was found to have a weight loss of 30x10^3 mg due to corrosion. The density of the steel is 8.0 g cm^{-3}. Calculate the Corrosion Penetration Rate in mm/yr.

                                                            (3)   **(2)**   **(1,3)**   **(07)**

    c.   Mention the advantages of electrolessplating over electroplating and give the details of electroplating of Decorative chromium.

                                                            (2)   **(2)**   **(1,12)**   **(07)**

OR

3   a.   What is tinning? Explain the corrosion control by cathodic metal coating?

                                                            (2)   **(2)**   **(1,5)**   **(06)**

    b.   Define throwing power of plating bath. Find the throwing power of plating bath solution in a Haring-Blum cell. Given that the distances between the two cathodes are 6.6 cm and 8.6 cm from the anode and the metal deposits on the cathodes are 80 mg and 75 mg respectively.

                                                            (3)   **(2)**   **(1,3)**   **(06)**

    c.   How do you explain the influence of Current density, metal ion concentration, temperature and pH on electrodeposit?

                                                            (3)   **(2)**   **(1)**   **(08)**

UNIT - III   L   CO   PO   M

4   a.   Justify the objectives of cracking of petroleum and reforming of petrol. Explain construction and working of Fluidized bed catalytic cracking process

                                                            (3)   **(3)**   **(1,3)**   **(07)**

    b.   Describe bomb calorimeteric experiment for the determination of calorific value of solid fuel with a neat labeled diagram.

                                                            (2)   **(3)**   **(1,3)**   **(06)**

    c.   Mention the light sources used for infra-red spectrophotometer. Explain the instrumentation and applications of Differential scanning calorimetry (DSC).

                                                          (2)   **(3)**   **(1,5,12)**   **(07)**

Note: L (Level),CO (Course Outcome), PO (Programme Outcome), M (Marks)

<center>**OR**</center>

5 a. What is knocking? Explain the mechanism of knocking in petrol engine.

<div align="right">**(2)   (3)   (1,3)   (07)**</div>

   b. Define Gross calorific value and net calorific value. 0.85g of coal sample with 93% C, 5% hydrogen and 2% ash, on burning in the bomb calorimeter raised the temperature of 1.80 kg of water by 3.0 ^{0}C. Calculate the gross calorific value and net calorific value of coal, given
   Water equivalent of calorimeter = 0.24 kg, Specific heat of water=4.187 kJ kg^{-1} K^{-1}
   Latent heat of condensation of steam = 2457 kJ kg^{-1}.

<div align="right">**(3)   (3)   (1,3)   (07)**</div>

   c. Explain instrumentation and applications of flame photometer.

<div align="right">**(2)   (3)   (1,5,12)   (06)**</div>

<center>**UNIT - IV**</center>

<div align="right">**L   CO   PO   M**</div>

6 a. A polymer sample contains 15, 20, 25 and 40% of molecules of the polymer with molecular weights 12000, 13000, 14000 and 16000. Calculate the number average and weight average molecular weight of the polymer.

<div align="right">**(3)   (4)   (1,3)   (06)**</div>

   b. Write the synthesis and applications of ABS, Kevlar and PMMA

<div align="right">**(2)   (4)   (1,3,12)   (09)**</div>

   c. What are conducting polymers? Give the synthesis and applications of conducting polyaniline.

<div align="right">**(2)   (4)   (1,3)   (05)**</div>

<center>**OR**</center>

7 a. What is glass transition temperature? Explain any three factors influencing glass transition temperature.

<div align="right">**(2)   (5)   (1,3)   (07)**</div>

   b. Give the synthesis and applications of polycarbonate, polyurethane and epoxy resin.

<div align="right">**(2)   (5)   (1,12)   (09)**</div>

   c. What are photoconducting polymers? Write the synthesis and applications of poly vinyl carbazole

<div align="right">**(2)   (5)   (1,3)   (04)**</div>

<center>**UNIT –V (Compulsory)**</center>

8 a. Define COD and BOD.
   25 ml of waste water was diluted to 500ml and equal volumes are filled in two BOD bottles. In the blank titration 100ml of diluted waste water when titrated immediately required 6.8ml of 0.02N $Na_2S_2O_3$. 100ml of the incubated sample after 5 days required 4.1ml of same $Na_2S_2O_3$. Calculate BOD of the wastewater.

<div align="right">**(3)   (5)   (1,3)   (07)**</div>

   b. How to desalinate saline water by electrodialysis?
   50 ml of an Industrial sewage has consumed 10.6 ml of 0.5 N $K_2Cr_2O_7$ solution for complete oxidation. Calculate COD of industrial sewage.

<div align="right">**(3)   (5)   (1,3,5)   (08)**</div>

   c. Explain the inert gas condensation method of synthesizing nanoparticles.

<div align="right">**(2)   (4)   (1,5,12)   (05)**</div>

<center>Note: L (Level),CO (Course Outcome), PO (Programme Outcome), M (Marks)</center>

First/Second semester B.E. Fast Track Semester End Examination, July/August 2019
ENGINEERING CHEMISTRY/APPLIED CHEMISTRY

Time: 3 Hours   **Max. Marks: 100**

Instructions: 1.   *Unit I and Unit V are compulsory*
                  2.   *Write any one full question from each Unit II, III and IV*

		UNIT – I (Compulsory)	**L**	**CO**	**PO**	**M**
1	a.	Name any four types of electrodes. Explain construction and working of calomel electrode?	**(2)**	**(1)**	**(1,3)**	**(10)**
	b.	Identify types of batteries. Calculate EMF of the following cell Fe/Fe^{2+}(0.01M)//Cu^{2+}(0.5M)/Cu. The standard reduction potentials of Fe and Cu are -0.44 V and 0.34 V respectively.	**(3)**	**(1)**	**(1)**	**(05)**
	c.	What is photovoltaic cell? Explain Module, Panel and array.	**(2)**	**(1)**	**(1,3)**	**(05)**

		UNIT – II	**L**	**CO**	**PO**	**M**
2	a.	Explain electrochemical theory of corrosion by taking iron as an example.	**(2)**	**(2)**	**(1)**	**(06)**
	b.	Identify and explain type of corrosion occurring in the following i) Iron nail partially hammered inside the concrete wall. i) Copper plate in contact with iron nails.	**(3)**	**(2)**	**(1)**	**(08)**
	c.	Differentiate electroplating and electroless plating techniques. Explain electroplating of Chromium with bath conditions and reactions.	**(3)**	**(2)**	**(1,3)**	**(06)**

<p align="center">OR</p>

			L	**CO**	**PO**	**M**
3	a.	Explain impressed current technique which is used to control the corrosion? A thick steel sheet of area 250 cm^2 is exposed to corrosive atmosphere. After one year period it was found to experience a weight loss of 200 g due to corrosion. The density of steel is 7.9 g/cc. calculate corrosion penetration rate.	**(3)**	**(2)**	**(1,3,12)**	**(06)**
	b.	Calculate the throwing power of plating bath solution in a Haring-Blum cell if the distances between the two cathodes are 5.6 cm and 6.9 cm from the anode and the masses of the plating on the cathodes are 65 mg and 62 mg respectively.	**(3)**	**(2)**	**(1,3,5)**	**(06)**
	c.	Explain effect of Temperature and pH on nature of electrodeposit and list out technological importance of metal finishing.	**(2)**	**(2)**	**(1)**	**(08)**

		UNIT - III	**L**	**CO**	**PO**	**M**
4	a.	What is reforming? Give at least four reactions involved in the reforming of gasoline.	**(2)**	**(3)**	**(1)**	**(06)**

	b.	Calculate Gross and Net calorific value of a fuel sample from the following data obtained from bomb calorimeter experiment.
		  I. Weight of fuel sample: 0.75g
		  II. Water equivalent of Calorimeter: 650 g
		  III. Weight of water taken in calorimeter:1500g
		  IV. rise in temperature: 2.3°C
		  V. Latent heat of steam: 587 cal/g
		  VI. Percent of Hydrogen in fuel sample: 2.5%
		  VII. Specific heat of water 4.187 kJ/kg/K
			(3)	**(3)**	**(1,5)**	**(06)**

c. Identify advantages of biodiesel over petro-diesel. Explain instrumentation and applications of flame photometer.

(3)	**(3)**	**(1,5,12)**	**(08)**

OR

5 a. Define Gross calorific value. Describe bomb calorimeter experiment with neat labeled diagram

(2)	**(3)**	**(1,5)**	**(07)**

b. Define cracking. Explain fluidized bed catalytic cracking process with neat labeled diagram.

(2)	**(3)**	**(1,5)**	**(07)**

c. Explain instrumentation of UV visible spectrophotometer with neat labeled diagram and give applications

(2)	**(3)**	**(1,5)**	**(06)**

UNIT - IV   **L**   **CO**   **PO**   **M**

6 a. A polymer sample contains 20, 20, 25 and 35% of molecules of the polymer with molecular weights 12000, 14000, 16000 and 18000. Calculate the number average and weight average molecular weight of the polymer.

(3)	**(4)**	**(1)**	**(06)**

b. Identify the importance of glass transition temperature in polymers usage? Explain any three factors affecting Tg.

(3)	**(4)**	**(1)**	**(09)**

c. What are conducting polymers? Explain the synthesis and applications of polyaniline.

(2)	**(4)**	**(1,3)**	**(05)**

OR

7 a. Give synthesis, properties and applications of polymethyl meth acrylate and Kevlar.

(2)	**(4)**	**(1,3,12)**	**(08)**

b. Write reactions involved in synthesis of polyurethane and polyvinyl carbozole and give their applications.

(2)	**(4)**	**(1,3,12)**	**(06)**

c. Define biodegradable polymers. Give synthesis and applications of poly lactic acid

(2)	**(4)**	**(1,3)**	**(06)**

UNIT –V (Compulsory)   **L**   **CO**   **PO**   **M**

8 a. 25 ml of waste water was diluted to 500ml and equal volumes are filled in two BOD bottles. In the blank titration 100 ml of diluted waste water when titrated immediately required 5.0 ml of 0.02 N $Na_2S_2O_3$. 100 ml of the incubated sample after 5 days required 2.5 ml of same $Na_2S_2O_3$. Calculate BOD of the wastewater.

(3)	**(5)**	**(1,5)**	**(06)**

b. Explain steps involved in primary treatment of sewage water? 25 ml of an Industrial effluent sample for COD is reacted with 30 ml of $K_2Cr_2O_7$ solution and the unreacted $K_2Cr_2O_7$ requires 9.5 ml of 0.25 N FAS solution. Under similar conditions, in blank titration 15 ml of FAS is used up. Calculate COD of the sample.

(3)	**(5)**	**(1,3,5)**	**(08)**

c. Define nanomaterials? Explain synthesis of nanoparticles by inert gas condensation process.

(2)	**(4)**	**(1,3,12)**	**(06)**

Note: L (Level),CO (Course Outcome), PO (Programme Outcome), M (Marks)