Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

II SEMESTER B.TECH END SEMESTER EXAMINATIONS,

JUNE/JULY 2016 (MAKEUP)

SUBJECT: ENGINEERING CHEMISTRY [CHM 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 02/07/2016 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- **Write equations, examples or diagrams wherever necessary.**

1A. Differentiate between the following;

i) Ionic bond and metallic bond

ii) Concentration polarization and kinetic polarisation

1B. About 1.5 g of coal on combustion gave 0.5240 g of CO_2 and 0.0234 g of H_2O and the same amount of coal when Kjeldalized, the evolved NH_3 gas was absorbed in 50.0 mL of 0.1 N H_2SO_4. After absorption, the excess acid required 6.25 mL of 0.1 N NaOH for exact neutralization. Calculate the percentage of carbon, hydrogen and nitrogen in the coal sample.

1C. Explain the construction and working of nickel cadmium battery and proton exchange membrane fuel cell. Why lead-acid battery should not be kept idle in partially charged condition?

[2+3+5]

2A. i) What is season cracking of brass?

ii) Write any two requirements to be satisfied by the biomaterials in order to use them for vascular grafting.

2B. The emf of the cell Ag|AgCl(s)|HCl(aq.)|Hg_2Cl_2(s)|Hg is 45.5 mV at 298 K and dE/dT is 0.338 K^{-1}. Find ΔG, ΔH and ΔS for the cell reaction at 298 K.

2C. Explain the intergranular corrosion occurring in 18-8 stainless steel. Describe the anodic protection method used to protect the steel tank for the storage of sulfuric acid by using the concept of passivity of metals.

[2+3+5]

3A. Justify the following;

i) The electrode potential of calomel electrode is dependent on the concentration of KCl used.

ii) Pipes of different materials such as copper and steel should not be embedded in a trench in close proximity

3B. Polymer molecules with different degree of polymerization 100, 400, 700 and 1000 are mixed in the molecular ratio 1:3:5:6 in a sample of polyvinyl chloride. Calculate the number average, weight average molecular weights and its polydispersity index (Mol. Mass of monomer- 62).

3C. Explain the process involved in the fluidized bed catalytic cracking process. Write any four advantages of catalytic cracking process.

[2+3+5]

4A. Give reasons for the following;

i) Machine parts to be protected should not contain crevices and sharp corners.

ii) PVD method could be used for multicomponent deposition but not CVD.

4B. For the electrochemical cell reaction,

$$Al\ (s) + Fe^{3+}\ (0.005\ M) \rightleftharpoons Al^{3+}\ (0.25\ M) + Fe\ (s)$$

the cell potential is 1.59 V at 298 K. Write the cell representation and calculate E^{o} cell. Determine the cell potential if the concentration of Fe^{3+} is changed to 0.05 M.

4C. Explain the batch melting process of manufacture of glass. How the property of cement will be affected by variation in the proportion of silica? Discuss any two types of ceramic fabrication methods.

[2+3+5]

5A. i) Why plastic surface is treated with a mixture of stannous chloride and palladium chloride during its electroless plating?

ii) Why rusting of iron is faster in saline water than in ordinary water?

5B. 1.0 g sample of octane was burnt in a bomb calorimeter containing 1200 g of water at an initial temperature of 298 K. After the reaction, the final temperature of the water is 306.2 K. The water equivalent of the calorimeter is 400 g. The specific heat of water is 4.184 J/g K and % of hydrogen in the fuel is 0.6. Why higher the calorific value and lesser the moisture content better is the quality of fuel ?

5C. Explain the construction and working of glass electrode. Why the use of glass electrode is restricted only to a limited pH range of solution?

[2+3+5]

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