B. E. First Semester (ALL)/SOE_18-19_Rev_FY-201 Examination

Course Code : GE 2103 **Course Name : Engineering Chemistry**

Time : 2 Hours] [Max. Marks : 40

Instructions to Candidates :—

(1) Attempt any **Four** questions out of **Six**.
(2) All questions carry **Ten** marks.
(3) Assume suitable data wherever necessary.
(4) All questions carry marks as indicated.
(5) Due credit will be given to neatness and adequate dimensions.
(6) Diagrams and chemical equations should be given wherever necessary.
(7) Use of Logarithmic tables, non – programmable calculator, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

1. (A) Solve any **One** (A or B) :

(A1) Water sample has the following analysis
$Ca(HCO_3)_2$=81 ppm, $Mg(HCO_3)_2$ = 14.6 ppm, $CaCl_2$=55.5 ppm, $MgCl_2$ = 9.2 ppm, $CaSO_4$ = 68 ppm.

Calculate amount of lime (86% pure) and soda (90% pure) required to soften one million liters of above water if aluminum sulphate is used as coagulant @of 57 ppm. 7(CO1)

(A2) State the advantages of break point chlorination. 3(CO1)

OR

(B) (B1) An exhausted zeolite softener was regenerated by passing 200 liters of NaCl solution having the strength of 10 g/*l* of NaCl. Find the total volume of water that can be softened by this softener, if the hardness of water is 300 ppm. 4(CO1)

(B2) What are the causes of scale formation ? Discuss its disadvantages. 6(CO1)

2. Solve any **One** (A or B) : (CO2)

(A) (A1) Describe construction, working, advantages and disadvantages of H_2–O_2 fuel cell. 7

(A2) Distinguish between Primary and secondary batteries. 3

OR

(B) (B1) State and explain Faraday's laws of electrolysis. Write its mathematical form. 5

(B2) Write advantages, disadvantages and applications of I.i–ion battery. 5

3. Solve any **One** (A or B) : (CO2)

(A) (A1) Give Reason :

(i) A pure metal rod half immersed vertically into water starts corroding at the bottom.

(ii) Iron corrodes faster than aluminium although iron is placed below aluminium in the electrochemical series. 4

(A2) Describe factors affecting rate of corrosion on the basis of nature of the metal. 6

OR

(B) (B1) What is cathodic protection ? How is it achieved using sacrificial anode and impressed current ? 7

(B2) Distinguish between Galvanizing and Timing. 3

4. Solve any **One** A or B : (CO3)

(A) (A1) An oil sample under test has a Saybolt universal viscosity same as that of standard Gulf oiland Pennsylvanian oil at 210^0F. Their Saybolt universal viscosities at 100^0F are 320, 430 and 260 respectively. Calculate the viscosity index of the sample oil. 3

(A2) Under which conditions solid lubricants are used ? Discuss how graphite works as a solid lubricant. 7

OR

(B) (B1) Explain Thin film mechanism of lubrication. 5

(B2) Define and write the significance of following :

(i) Viscosity and Viscosity index.

(ii) Cloud point and Pour point. 5

5. Solve any **One** (A or B) : (CO3)

(A) (A1) A coal sample by weight has following % composition C = 76%, H = 5.2%, O = 12.8% S = 1.2% N = 2.7% remaining being ash

Calculate :

(i) Minimum weight of air required per kg of fuel.

(ii) % composition (by volume) of dry product, if 50% excess air is supplied. 7

(A2) Write the significance of proximate analysis of coal. 3

OR

(B) (B1) Explain determination of calorific value of a solid fuel by using Bomb Calorimeter. 7

(B2) Define Cetane number and octane umber. 3

6. Solve any **One** A or B : (CO4)

(A) (A1) How is Portland cement manufactured by wet process ? Give various reactions taking place in rotary kiln ? 7

(A2) State AntiMarkovnikov's rule. 3

OR

(B) (B1) Which type of cement will you recommend for the following and why ?

(a) Construction of piers and dams of allied monolithic mass concrete work.

(b) Concrete exposed to marine and reactive environment.

(c) Repairing and construction of border roads during energency. 4

OR

(B) (B2) What are liquid crystals ? How are they classified ? Describe their general properties and applications. 6