BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2019

[1st year, 2nd Semester (Old)]

CHEMISTRY FOR CIVIL ENGINEERING

Time: Three hours

Full Marks:100

Answer *any five* questions

1. (a) Define glass physically and chemically. Briefly enumerate the physical and chemical properties of glass. What do you mean annealing? Mention the importance of annealing.

   3+6+4+2

   (b) Write a concise note on "Glass wool".

   5

2. (a) What is porcelain? Mention the important requirements of porcelain.   4+3

   (b) Write down the chemical reactions occurring in the furnace during the manufacture of glass. What do you mean by "Batch Material" in the context of manufacture of glass?

   4+2

   (c) What is glazing? How glaze can be applied on glass wares?   3+1

   (d) Write down the chemical formulae of the following (**any three**):   3

   (i) Alumina (ii) Slaked lime (iii) Magnesia (iv) Quick lime

3. (a) What is lime? Classify different types of limes. Write a concise note on any type of lime of your choice.

   2+2+5

   (b) What is tar? Mention some of its uses.

   2+2

   (c) What is asphalt? Mention its various types of uses.

   2+3

   (d) What is 'Russian Oil'?

   2

4. (a) Write down all the chemical reactions involved in setting of cement.   4

   (b) Write down about PPC and Portland Slag Cement.   2+2

   (c) Write down the advantages of fly-ash based cement over OPC. What are the raw materials for the manufacture of fly ash brick?   2+2

   (d) Write down all the reactions involved at lower end of the Kiln during the production of Portland cement.

   1+3

(e) What are the composition of common bricks? Describe about the classification of mineral based refractories according to their chemical composition.   2+2

5. (a) 'Nature of oxides formed on metal surface plays an important role in oxidation corrosion Process' - comment on the statement.

(b) Discuss 'Marker' Experiment.

(c) Discuss Passivity.

(d) Write short note (**any two**):

(i) Galvanic corrosion (ii) Deposite corrosion (iii) Caustic Embrittlement.   4+4+4+4+4

6. (a) Define Viscosity Index (VI). What do you mean by VI =0 and VI =100?   5

(b) Discuss Neutralization and Saponification values.   5

(c) Draw a suitable Pourbaix diagram for Fe(III)/Fe(II) system. Explain in detail. Given the Ksp of $Fe(OH)_3$ and $Fe(OH)_2$ are 10^{-38} and 10^{-17} respectively. The fresh water value of [Fe(III)] and [Fe(II)] are 10 micro molar each.   10

7. (a) Calculate the pH, at which MnO_4^-/Mn^{2+} ($E^0 = 1.51$ V) and Cl_2/Cl^- ($E^0 = 1.36$ V) will have same formal potential.   5

(b) Calculate the pH, at which $Fe(OH)_3$ starts to precipitate from a solution of 0.01(M) Fe(III) solution. Given Ksp ($Fe(OH)_3$) = 10^{-38}. Calculate also the pH, at which the precipitation is 99.99% complete.   4+4

(c) Draw the structure of Mg-EDTA complex.   2

(d) What do you mean by hard and soft water? What do you mean by temporary and permanent hardness ?   2+2

(e) Write the name of an indicator used in complexometric titration.   1