BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2018

(1st year, 2nd Semester)

CHEMISTRY FOR CIVIL ENGINEERING

Time: Three hours | Full Marks: 100

Answer *any five* questions

1. (a) What is glass? Mention its physical and chemical properties. What is annealing? What is the importance of annealing? 3+6+4+2=15
   (b) What is glass wool? Mention some of its uses. 2+3=5

2. (a) What is porcelain? Mention the important requirements of porcelain. 4+3=7
   (b) What is ceramics? 2
   (c) What is glazing? 2
   (d) What is lime? Distinguish between fat lime and hydraulic lime. 2+5=7
   (e) What is tar? Mention some of its uses. 1+1=2

3. (a) What is asphalt? Mention its various types of uses. 2+3=5
   (b) What is 'Russian Oil'? 3
   (c) Write a short note on setting and hardening of limes. 5
   (d) Write down the chemical reactions occurring in the furnace during the manufacture of glass. 7

4. (a) Write down all the chemical reactions involved during the manufacture of Portland cement. 4
   (b) What do you mean by setting of cement? What are the roles of $Ca(OH)_2$ and $Al(OH)_3$ during the setting? 2 +2=4
   (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=4
   (d) What are the refractory materials? Classify refractory materials with examples based on chemical composition. 1+3=4
   (e) What are the various processes occurred at the pretreatment step during the manufacture of refractory bricks? Write down about the properties and uses of zirconia bricks. 2+2=4

5. (a) Discuss differential aeration corrosion. Give examples.
(b) Discuss mechanism of wet corrosion in neutral and acidic condition.
(c) Discuss passivity. Give example.

(d) Write short note (any two)

(i) Pitting (ii) Microbiological corrosion (iii) Marker experiment 4+4+4+4+4=20

6. (a) Calculate the pH at which $Fe(OH)_2$ starts to precipitate from a solution of 10^{-5} Fe(II) solution. 5
(b) What is meant by hardness of water? In what unit, hardness is expressed? Write the name of an indicator as used in complexometric titration. 2+2+1=5

(c) What is friction? Discuss different types of friction. 5

(d) Mention important characteristics of liquid lubricants. Discuss different types of liquid lubricants. 5

7. (a) Draw a Pourbaix diagram for H^+/H_2 system (E^0= 0 V) and O_2/H_2O system (E^0=1.23 V). 5
(b) Calculate the H^+ concentration, at which both MnO_4^-/Mn^{2+} and $Cr_2O_7^{2-}/Cr^{3+}$ have the same formal potential.

Given, $E^0(MnO_4^-/Mn^{2+})$ = 1.51 V, $E^0(Cr_2O_7^{2-}/Cr^{3+})$ = 1.36 V. 5

(c) Find out the relation between the stepwise and over all stability constants for $[Ni(H_2O)_6]^{2+}$ 5
(d) Draw the structure of EDTA and Ca-EDTA. 5