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Total No. of Questions : 4]

SEAT No. :

P1270

[Total No. of Pages : 2

OCT/FE/INSEM-3
F.E. (Phase - I)
ENGINEERING CHEMISTRY
(2019 Pattern)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Solve either Q.No.1 or Q.No.2 and Q.No. 3 or Q.No.4.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Describe Deionisation method of water softening with ion - exchange and regeneration reactions. [5]
- b) Explain the causes and give preventive measures of caustic embrittlement in boilers. [4]
- c) What is hardness of water? Define temporary and permanent hardness. [3]
- d) Water sample is not alkaline to phenolphthalein. However, 25 ml of this water sample on titration required 4.5ml 0.02 N HCl for methyl orange end point. Determine the type and amount of alkalinity present in water. [3]

OR

- Q2)** a) Define scales. Explain in brief four causes of deposit formation in boilers. [5]
- b) What is reverse osmosis? Describe the process with labelled diagram. [4]
- c) The hardness of 50000 litres of water sample was removed by passing it through a zeolite bed. The zeolite bed then required 200 liters of NaCl solution, containing 100 g / liter of NaCl for regeneration. Calculate the hardness of water sample. [3]
- d) 25 ml of water sample required 8.8 ml of 0.01M EDTA to reach the end – point . 25 ml of the same water sample after boiling and filtration required 6.5 ml of the same EDTA solution to reach the end - point . Calculate total and permanent hardness of the water sample. [3]

P.T.O.

- Q3)** a) Explain the three stages of pH metric titration between strong acid and strong base with titration curve and reaction. [5]
- b) What is a reference electrode? Explain the construction of calomel electrode with labelled diagram and give its representation. [4]
- c) Explain the construction of a conductivity cell with labelled diagram. [3]
- d) Give the composition of the membrane of the ion selective electrode used for the determination of H^+ , F^- and Cl^- . [3]

OR

- Q4)** a) Explain the three stages of conductometric titration between strong acid and strong base with titration curve and reaction. [5]
- b) What are Ion Selective Electrodes? Give the composition and working of enzyme based membrane for determination of urea, with figure. [4]
- c) Define the following terms and give their SI units. [3]
- i) Equivalent conductance
 - ii) Specific conductance
- d) Which are the different types of buffer solutions? Give example of each type. [3]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P3

FE/Insem./APR - 3

F.E. (Semester - II)

107009 : ENGINEERING CHEMISTRY

(2019 Pattern)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Solve either Q. No. 1. or Q. No. 2. and Q. No. 3. or Q. No. 4.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain procedure for EDTA method of determining of total hardness of water sample. Draw metal EDTA complex and give chemical reactions involved. **[5]**

b) Explain causes, disadvantages and preventive measure of caustic embrittlement. **[4]**

c) Give exchange reactions of zeolite with following salt. **[3]**

i) $\text{Ca}(\text{HCO}_3)_2$ ii) MgCl_2 iii) CuSO_4

d) 100 ml of an alkaline water sample requires 5.2 ml of 0.02 M HCl up to phenolphthalein end point and 15.8 ml for methyl orange end point. Find the type and amount of alkalinity in water sample. **[3]**

OR

Q2) a) Describe deionization method with figure, process, ion exchange reactions for softening of hard water **[5]**

b) What is priming and foaming? Give any three disadvantages of priming and foaming. **[4]**

c) 50 ml of water sample require 18 ml of 0.05 M EDTA during titration. Whereas 50 ml of boiled water sample, require 12.5 ml of same EDTA in the titration. Calculate total, temporary and permanent hardness of water sample. **[3]**

P.T.O.

- d) A zeolite bed exhausted by softening 4000 lit. of water requires 10 litres of 15% NaCl solution for regeneration calculate the hardness of water sample. [3]

Q3) a) What is reference electrode? Give construction of calomel electrode with labelled diagram and its representation. [5]

b) What are ion selective electrode? Discuss the composition and working with labelled diagram of fluoride ion selective electrode. [4]

c) Define the following terms:- [3]

- i) Specific conductance
- ii) Cell constant
- iii) Equivalent conductance

d) Give the procedure for standardisation of PH - meter. [3]

OR

Q4) a) Draw and explain the various stages of PH metric titration curve for the titration of HCl Vs NaOH. Give the reactions involved in it. [5]

b) Give the constructions of glass electrode with labelled diagram, its representation and applications. [4]

c) Explain why [3]

- i) In weak acid and weak base conductometric titration the conductance remains nearly constant after equivalence point.
- ii) In conductometric titration of weak acid and strong base the conductance increases till equivalence point.

d) Explain the construction of conductivity cell with labelled diagram. [3]
