

Total No. of Questions : 4]

SEAT No. :

PB2

[Total No. of Pages : 2

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**F.E. (All Branches) (Insem)
ENGINEERING CHEMISTRY
(2019 Pattern) (Semester - II) (107009)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q1 or Q2 and Q3 or Q4.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 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) Define scales. Explain four causes of deposit formation in boilers. [5]
- b) Give the ion-exchange and regeneration reactions involved in the deionisation of water containing $MgCl_2$. [4]
- c) Define : [3]
- i) Permanent hardness
 - ii) Foaming
 - iii) Caustic embrittlement
- d) 25 ml. of hard water sample required 11.2ml of 0.01MEDTA to reach the end-point. 25ml of the same water sample after boiling and filtrations required 7.9ml of the same EDTA to reach the end-point. Calculate total, temporary and permanent hardness of water. [3]

OR

- Q2)** a) Define hardness. Give the structure of Na_2EDTA . Explain the EDTA method for determination of total hardness of water with reactions and formula. [5]
- b) What is reverse osmosis? Explain the process of reverse osmosis with figure. [4]

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- c) 50 ml. of alkaline water required 5.7 ml of 0.02 N HCl to reach the phenolphthalein end-point and further 5.7 ml of the same acid to reach the methyl orange end-point. Calculate the type and amount of alkalinity of water. [3]
- d) A zeolite bed was exhausted by passing 5100 lit. of hard water. It required 120 lit. of brine containing 15g/lit. of NaCl for regeneration. Calculate the hardness of water. [3]
- Q3)** a) Explain the three stages of PH metric titration between strong acid and strong base. Give the reaction and draw the titration curve. [5]
- b) What are ion-selective electrodes? Give the composition of the ISE membrane for determination of F^- , Cl^- and urea. [4]
- c) Give construction with neat, labelled diagram and representation of glass electrode. [3]
- d) Explain the construction of conductivity cell with neat labelled diagram. [3]

OR

- Q4)** a) Explain the three stages of conductometric titration between CH_3COOH and NH_4OH with titration curve and reaction. [5]
- b) Define the following terms. [4]
- Specific conductance
 - Reference electrode
 - Molar conductance
 - Buffer
- c) Explain why : [3]
- In pH metric titration of HCl against NaOH the pH at equivalence point is 7.
 - In conductometric titration of HCl vs NaOH the conductance decreases rapidly till equivalence point.
- d) Which electrodes are used in pH metric titration of HCl vs NaOH? Give the procedure for calibration of pH meter. [3]

