**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.***

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***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]**

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