Following conclusions can be drawn on the basis of results that have been presented and discussed in the present work.

Synthesis of the polyelectrolytes of some vinyl monomers (maleic acid, acrylic acid) and co-polymers of (acrylic acid and maleic acid) using solution polymerization technique and free radical initiator method were performed. The polymers and co-copolymers using various initiators like hydrogen peroxide and sodium persulphate were synthesized. During the synthesis, several variables concentration of the initiators, temperature of the polymerization reaction was varied and the effect of those variables on the polymerization process was studied. The synthesized polymers were characterized by using FTIR spectroscopy for their functional group analysis. The expected structure and functional groups, which are responsible for the antiscaling property of polymers, are confirmed.

The synthesized polymers were characterized for their molecular weight by using the Ostwald viscometry method and molecular weight was determined using Mark-Houwink equation and the constants, K and α for various polymers. The polymers were also characterized for their molecular weight using Vapour Pressure Osmometry method.

The inhibition ability on calcium scale was high at the high concentration of the polymaleic acid and at low temperature. The sequestering capacity of the polyacrylic acid was high at low concentration of the polymer and at low temperature.
As the concentration sodium persulphate initiator increased from 0.5, 0.75 and 1 gm, the number average molecular weight was found to reduced to be 6802, 5565 and 4709 g mol\(^{-1}\) respectively. The same trend was observed in case of polymaleic acid synthesis. It is found that the increase in the concentration of the initiator results in decrease in the molecular weight of the polymers. Furthermore, the increase temperature of the reaction results in the low molecular weight of the synthesized polymer.

When polyacrylic acid of A, B and C-type used in solution containing CaSO\(_4\) salt. The maximum percentage inhibition was 71 % for 20 ppm of optimum concentration for C-type polyacrylic acid polymer. However it was 75 % for 15 ppm of optimum concentration for C-type polyacrylic acid polymer for CaCO\(_3\) salt solution.

The percentage inhibition was 78, 75 and 69 % at 10 ppm optimum concentration of C, B and A type of polymaleic acid polymer respectively for solution containing CaSO\(_4\) salt, while it was 70, 68 and 60 % at optimum concentration of 10 ppm of C, B and A type of polymaleic acid polymer respectively for CaCO\(_3\) salt solution.

When copolymer of polyacrylic and polymaleic acid were used for the system CaSO\(_4\) salt, the maximum percentage inhibition was 82 % at the end of 24 h for 30 ppm optimum polymer concentration. These results strengthened by the results of the conductivity measurement of the solution.

The SEM and XRD of the deposited salt of CaSO\(_4\) and CaCO\(_3\) show that the morphology of the deposited crystals greatly influenced by the presence of the antiscaling agents. Antiscaling agents work by the mechanism of crystal distortion or dispersion results in reduced crystallinity with spongy deposits.
The results obtained in the study of percentage inhibition have been strengthened by the results of the rate constant measurement. It is found that the value of rate constant was $0.0595 \times 10^{-4}$ ppm$^{-1}$ h$^{-1}$ for control condition. The values of rate constants was $3.6 \times 10^{-6}$, $2.97 \times 10^{-6}$, $2.32 \times 10^{-6}$, $2.53 \times 10^{-6}$ and $3.1 \times 10^{-6}$ ppm$^{-1}$ h$^{-1}$ for 5, 10, 15, 25 and 25 ppm polymer concentrations respectively. From the values of rate constants for A-type of polyacrylic acid polymer, the least value of rate constant i.e. $2.32 \times 10^{-6}$ ppm$^{-1}$ h$^{-1}$ was recorded. Therefore, 15 ppm of A-type polyacrylic acid is the optimum concentration of polymer dose for given set of conditions. Theses results are similar to those obtained in the process of inhibition test.

Heat transfer coefficients and fouling factors have been determined at the flow rate of 100, 200 and 300 lph. Heat transfer coefficient was coefficient in clean condition was 2023.1 w/m$^2$ 0°C, 2221.9 w/m$^2$ 0°C and 2481.6 w/m$^2$ 0°C. The reduction in heat transfer coefficient was more in fouled conditions. Polymers of PAA, PBB and PCC were tested and found the PAA is more effective antiscaling agents. Using modeling and simulation of deposition process mass deposited predicted by modeling and simulation was 0.09185 Kg/ m$^2$ and experimentally it is found to be 0.0855 kg/m$^2$ at 100 lph flow rate in control condition. At flowrate of 300 lph, using co-polymer of acrylic acid and maleic acid the deposition predicted by modeling and simulation 0.0480 kg/m$^2$ and experimentally found to be 0.0465 kg/m$^2$. It is observed that the model predicts the measured mass deposition with reasonable accuracy.