Conclusion

By using Lie group analysis, we first obtained the symmetries of the partial differential equations. We reduced the partial differential equations to a system of ordinary differential equations. The resulting ordinary differential equations obtained by using scaling symmetry together with boundary conditions are solved numerically. From the numerical solutions, the following results are obtained.

- Increasing thermal Grashof number increases the velocity and decreases the thermal and solutal boundary layer thicknesses.

- Increasing the Prandtl number increases the momentum boundary layer thickness and decreases the thermal boundary layer thickness.

- The velocity decreases and temperature and concentration of the fluid increase with an increase in the solutal Grashof number.

- The velocity of the fluid along the boundary layer increases and the temperature and concentration of the fluid decrease with increase in the Schmidt number.

- Velocity and temperature of the fluid increase and concentration decreases with increase in the radiation parameter.

- The thicknesses of the thermal and concentration boundary layers are decreased on increasing the chemical reaction parameter. The velocity of the fluid increases with increase in the chemical reaction parameter.

- The velocity and temperature increase significantly when the value of heat generation parameter increases.

- The velocity and temperature decrease with increase in the porosity parameter.

- The momentum and thermal boundary layer thicknesses increase with increase in the thermal conductivity parameter.

- The temperature and velocity of the fluid decrease at a very fast rate in the case of water in comparison with air.