# CHAPTER V

# CONCLUDING REMARKS

## 5.1 Conclusion

This thesis is concerned with the response of dynamic interaction between a vertically loaded rigid circular cylinder and a homogeneous poroelastic half-space medium. The cylinder surface is assumed to be either fully permeable or impermeable and perfectly bonded with the surrounding half-space. The Biot's poroelastodynamic theory and an indirect boundary integral equation method are employed to study this dynamic interaction problem. The present scheme is based on the distributions of singular loads and fluid sources on a fictitious surface interior to the surface on which the boundary conditions are specified. The influence functions for displacements, stresses, pore pressure and fluid discharge of a poroelastic half-space subjected to time-harmonic, axisymmetric buried loading and fluid source are directly obtained from solutions given in Appendix. Analytical solutions for poroelastic fields appear in terms of semi-infinite integrals with complex-valued integrands and Bessel functions. The numerical quadrature scheme employed in this study to compute the influence functions results in stable and accurate solutions.

The convergence and numerical stability of the present solution scheme with respect to $N$, $N'$ and $\Delta a$ are investigated in chapter IV. From the convergence study, the numerical solutions are found to be stable when $N = 30\text{-}40$, $N' = 60\text{-}80$ and $\Delta a = 0.1\text{-}0.25$. In addition, the accuracy of the present scheme is confirmed by comparing with existing solution for an elastic half-space.

Numerical results presented in chapter IV indicate that the interaction problem is governed by several parameters. The influence of these parameters on the interaction problem could be summarized as follows:

1. The present solution scheme, based on indirect boundary integral equation method, is capable of investigating the interaction problem over a wide range of frequencies. In addition, the computation becomes more consistent, simple and numerically efficient than non-uniform body force method.

2. The vertical impedances are significantly influenced by the shape of the cylinder, the type of the foundation, the hydraulic boundary conditions and the frequency of excitation.

3. The poroelastic material properties and the hydraulic boundary conditions of the cylinder have a significant influence on vertical impedances of the cylinder when the non-dimensional frequency $\delta > 1.0$.

## 5.2 Suggestions for Future Work

There are two main aspects to be considered for a future extension of this work as follow:

1. The present solution scheme could be extended to analyze a cylinder embedded in a poroelastic half-space subjected to other types of loading such as lateral, moment and torsional loading, etc. In those cases, the Green's functions involving asymmetric deformations of a poroelastic half-space must be included in the formulation.

2. Since natural soil profiles are normally layered with different properties, impedances of a cylinder in layered poroelastic half-space should be examined.