CHAPTER V

CONCLUSIONS

The problem of load transfer from an elastic bar to an infinite medium has been investigated by many researchers in the past. In the earliest studies, the medium is commonly considered as a homogeneous elastic material. This assumption is not valid for the case when the medium is fluid saturated. Therefore, several investigators have later modeled the surrounding medium as a homogeneous poroelastic half-space which behaves according to Biot's theory of poroelasticity. Due to the fact that many physical systems, such as soil and biomechanical systems, are multilayered media. The surrounding medium should be considered as a multilayered medium in order to represent a more realistic approximation.

This thesis considers the problem of load transfer from an axially loaded elastic bar to a multilayered poroelastic half-space. The problem is analyzed by formulating the total potential energy functional of the bar-multilayered medium system from the assumed displacement function. The displacement function is assumed in the form of exponential function with a set of unknown constants. The strain energy of an elastic bar is formulated by the conventional structural analysis while the strain energy of a multilayered half-space is formulated by applying the concept of exact stiffness method[9]. Thereafter, the minimization of the total potential energy functional is applied to determine those

unknown constants and the time histories of the vertical displacement of the bar is obtained.

Numerical solutions presented in the chapter IV demonstrate the accuracy and the applicability of the present solution scheme. Selected results for different layered systems indicate that the axial displacement of the bar depends significantly on the properties of each layer as well as the bar itself. The influence of these parameters on the bar displacement may be summarized as follows:

1. The rate of bar displacement is depended on the permeability of each layer.

2. The initial and final vertical displacements of the bar are essentially controlled by the undrained and drained Poisson's ratios, respectively.

3. The moduli of elasticity of the bar and multilayered medium and the length of the bar have significant influence on the magnitude of vertical displacement.

It can be seen from the conclusions above that the response of a bar-multilayered system is governed by many parameters. For the real system, such as a pile embedded in surrounding soil, it is difficult to identify the influence of individual parameters separately on the response.

The present method can also be extended to analyze the load transfer problem when the bar is subjected to other types of loadings such as lateral,

moment and torsional loadings, etc. In addition, the case where the contact surface between the bar and the surrounding media is not fully permeable, i.e. pore pressure along the contact surface is developed, should be examined.