CHAPTER V

CONCLUSIONS

Experimental investigation has been performed on laminar flow in parallel duct with both long and short constrictions.

For a long constriction case, results may be summarized as follows:

(i) Figure 4.10 determines the loss coefficients due to abrupt contraction and expansion.

(ii) These loss coefficients, K_c and K_e, respectively, are slightly higher and lower than results obtained by numerical analysis.

(iii) Sudden contraction and expansion have profound effects on pressure only at very short distances near constriction inlet and outlet, Figs. 4.11, 4.12, and 4.13.

(iv) The "critical" constriction length can be predicted by eq.(4.4).

(v) The area ratio has affected the hydrodynamic entrance length.

For a short constriction case, results may be summarized as follows:

(i) Figure 4.14 represents the correction factors for the loss coefficients due to sudden contraction and expansion and for Fanning friction factor.

(ii) These correction factors differ, especially for C_e, from those obtained through numerical analysis.

(iii) Abrupt contraction and enlargement affect pressures not only at the constriction inlet and exit but at some distances inside the constriction also, Fig. 4.15 to 4.17.

(iv) Pressure distributions at the constriction exit is not similar to the numerical result, Fig. 4.15 and 4.18.

(v) The flow constriction causes a substantial augumentation in the flow friction.

(vi) Figure 4.1 through 4.6 show the visualization of flows in parallel ducts with sudden contraction and expansion as compared with Fig. 4.7 which represent streamlines from numerical analysis.

(vii) A linear pressure distribution is re-established at about 3 hydraulic duct diameter downstream of the constriction, thereby indicating a rather rapid redevelopment of the flow.

Suggestions for Further Study

(i) The present work can be extended to cover the study of heat transfer characteristics in a laminar duct flow affected by varying length and width of abrupt constriction ducts. The constriction wall temperature is kept at temperature higher than the flowing fluid, either as a constant wall temperature or as a constant heat flux.

(ii) Experimental study for fully developed laminar flow in rectangular ducts of various aspect ratios, isosceles triangular ducts of various opening angles, and annular ducts of various radius ratio can also be done to compare with available numerical results.

(iii) For fluid flow experiments in (i) and (ii), other working fluid such as air should also be used.