CHAPTER 10

SUMMARY AND CONCLUSION

A comprehensive study of the prediction of mechanical properties by artificial neural networks and other aspects like spirality of single jersey fabrics and low stress mechanical properties was undertaken and in view of the large amount of experimental investigations, it will be useful to present a general summary of the research work. There has been much research work on the handle and low stress mechanical properties of woven fabrics. However, there is a paucity of data on the low stress mechanical properties of knitted fabrics. The main aim of the research study was to investigate the possibility of prediction of low stress mechanical properties of knitted fabrics by artificial neural networks.

10.1 PREDICTION OF MECHANICAL PROPERTIES OF MECHANICAL PROPERTIES

A thorough review of the artificial neural network and its application has been undertaken and presented in Chapter 9. The pioneering research done on the spirality of knitted fabrics was highlighted. A brief overview of the instrumental methods to evaluate the mechanical properties was also given. A short review of the earlier work on the mechanical properties of knitted fabrics was given to highlight the need for more research activity on the evaluation of handle and low stress mechanical properties of knitted fabrics.
10.2 A NEW METHOD TO ELIMINATE SPIRALITY OF WEFT KNITTED FABRICS

Spirality in plain-knitted fabric is well known, and is caused by the twist liveliness of torque of yarns. It has been demonstrated that a yarn, which has been subjected to aqueous swelling five times, can completely remove the spirality. Also a yarn, which has been mercerised twice can also eliminate the spirality. Thus both aqueous swelling and double mercerisation have an effect on the spirality but the effect of aqueous swelling is more pronounced. Spirality can also affect the extension of the knitted fabric. It also leads to a decrease in extensibility in the wale direction, whereas it noticeably increases the extensibility in the direction perpendicular to the wales.

10.3 PREDICTION OF LOW STRESS MECHANICAL PROPERTIES BY ARTIFICIAL NEURAL NETWORKS

Development of neural networks based system for prediction of the mechanical properties of weft knitted fabrics has been presented. The correlation between the experimental and predicted values is very good and mean error percentage is very low. It can be stated that a neural network based system is a very useful and versatile tool for prediction of mechanical properties of weft knitted fabrics. The results have shown that a reliability of 95% and more can be reached.

This work has concentrated on many areas such as spirality, handle, prediction of mechanical properties by neural network, assessment of commercial 1 x 1 Rib fabrics. Each one of these has commercial relevance and the findings of the present study can be applied to advantage to many areas in knitting sector. The results can be profitably used for reducing spirality which will aid in a reduction in rejects during garment making.
The work on the use of different swelling treatments and combinations of employing them will be of immediate interest to fabric producers; five times boiling and two times mercerising have resulted in $0^\circ$ spirality. Knitted fabric manufacturers and garment makers particularly for exports can apply these techniques.

There are number of advantages in this process which are detailed below:

1. Permanent reduction, and in certain cases, even the elimination of skewing in single jersey fabric made from single ring spun yarn.

2. More light weight knitted fabrics compared to knitted fabrics made from two ply yarn.

3. The fabric has a better surface structure.

4. Less waste in making-up and

5. There is no need to carryout a separate steaming process on the knitted fabrics.

Since knitted fabric made from carded yarn has exhibited a better handle, its use can be explored. Its elongation is greater than that of the fabric made from combed yarn which is again a desirable property.

10.4 SUGGESTIONS FOR FURTHER RESEARCH

1. This study has dealt with knitted fabrics produced from different yarn structures. It will be worthwhile to carry out on woven fabrics to find out the effects these yarns might have on the handle of them. Also, the effects of applying certain finishes on
these fabrics with a view to enhancing their handle can be explored.

2. Another suggestion that may be given to reduce or completely remove spirality is to take the yarn and to steam it. A slight twist is put into the steamed yarn in the opposite direction to the original twist. If the original yarn twists in the Z direction and the slight twist applied after steaming is in the S direction, the yarn then has pure Z-twist and may be taken up for knitting. This can result in a considerable reduction in spirality and rejection of fabrics.

3. Yarns, which are being spun in Ring frame for purposes of knitting, may be wetted on the Ring frame by allowing water to trickle down on the front roller. This yarn may be directly wound onto the cone, and may be taken up for knitting on the machine. Special types of ring frames may be developed for this purpose. This may be tried for different directions of twist.

4. It would be desirable to develop packages for producing single and double jersey fabrics for designing them using computer. Product development is an area where a great deal of work is necessary on knitted fabrics.

5. An interlaboratory trials on the mechanical properties of 1 x 1 Rib, 2 x 2 Rib and Interlock can be carried out with the aid of several laboratories using Kawabata Evaluation System.

6. Production of knitted fabrics from doubled yarns may be undertaken. Also, knitted fabrics may be produced from fine count rotor yarns, and various aspects of knitting performance such as fly liberation may be studied.
7. Assessment of commercial interlock fabrics, which are used as outerwear should be made by using Kawabata system so as to find the variation existing among them. Such a study has not been made in the present work due to lack of time.

8. Gratings to measure spirality of weft-knitted fabrics can be prepared so that this property can be measured simultaneously for several wales at a time.