Summary and Conclusion

In this thesis mainly we focused on generating functions for the orthogonal functions such as Bessel, Hermite, Legendre, Laguerre, Jacobi and Gegenbauer polynomial. We determined some new unilateral, bilateral and trilateral generating functions. Of course through these generating functions, we recovered the results of well known mathematicians such as Exton, Appell, Lauricella, Saran, H. M. Srivastava, Das and Chatterjea. The thesis comprises five chapters, a Summary and Conclusion.

In chapter 1, we discussed the historical background, definitions and some relations that were of great concern with the study of generating
functions. We made this chapter as self contained through defining the elementary functions such as Gamma, Beta and some hypergeometric functions.

In chapter 2, we obtained new generating functions for Laguerre polynomials. Also, we notice that results which are obtained by us can be considered as generalizations of the results that have been studied previously. It may be noted that the result of Das and Chatterjea (one may refer [23]) fall out as particular cases of theorem 2.2.1 for \( m = 0 \) and \( a_n = 1 \). Also, we have shown that the result of Majumdar [45] is the particular case of theorem 2.2.1.

In chapter 3, we have obtained a new class of trilateral generating function. Also, we have noticed that; as in particular case of newly determined generating functions, we have there a new class of bilateral generating function. Moreover, the particular case of Corollary 3.6.1 for \( k = m = 0 \) is an unilateral generating function (3.6.4) and thereby substituting \( a_n = 1 \), we recovered the result of Rainville [52].

In chapter 4, We used the Laplace integral representations of Exton’s functions and with help of these representations, we determined new generating functions. We found that many of these relations involves Appell, Horn, Saran, Lauricella and Gaussian hypergeometric functions. Also, we recovered many of Exton’s results through our results.

In chapter 5, we deployed the Weisner method to determine the new generating functions for modified Legendre polynomial. In this chapter, we defined there the linear partial differential operators such as \( A, B, \)
$B^*, C, C^*, \mathcal{L}$ and $\mathcal{L}^*$. There we notice some commutative properties of these operators. Further, we extend these operators in exponential form and determined the new generating functions. We also believe that the operators 1, $A$, $B$ and $C$ form a Lie group.

In chapter 6, we summarized the work in this study of generating functions.

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