Contents

Foreword ........................................................................................................................................... vii
Preface ............................................................................................................................................... xi
§1. A general information on Legendre functions .............................................................................. 1
§2. The generalized associated Legendre functions ........................................................................... 11
§3. The series representations of the generalized associated Legendre functions ....................... 17
§4. Relations between different solutions of the generalized Legendre equation.
   Wronskians of linearly independent solutions .............................................................................. 25
§5. Relations between contiguous generalized associated Legendre functions ......................... 32
§6. Differential operators generated by the generalized associated Legendre equation ............... 35
§7. Asymptotic formulas for the generalized associated Legendre functions in
   a neighborhood of singular points ................................................................................................. 40
§8. Asymptotic representations of the generalized associated Legendre functions
   as functions of parameters ............................................................................................................. 48
§9. Integral representations of the generalized associated Legendre functions of
   the first kind ................................................................................................................................. 54
§10. Integral representations of the generalized associated Legendre functions of
    the second kind ........................................................................................................................... 60
§11. Zeros of the generalized associated Legendre functions .......................................................... 67
§12. Connection of the generalized associated Legendre functions with the
    Jacobi functions .......................................................................................................................... 71
§13. Integral relations and series with the generalized associated Legendre functions ................. 78
§14. Relations between the generalized associated Legendre functions, Bessel
    functions, elliptic integrals and incomplete B-functions ......................................................... 88
§15. Integral transforms with the generalized associated Legendre functions .............................. 96

xix
§16. Dual integral equations with the generalized Legendre function of the
first kind $P_{-1/2+n}^m(ch\alpha)$ ................................................................. 116

§17. Dual integral equations with $P_{-1/2+n}^m(ch\alpha)$ and the weight function $[1+G(\tau)]$ 123

§18. Triple integral equations with the generalized Legendre function
of the first kind $P_{-1/2+n}^m(ch\alpha)$ ................................................................. 126

§19. Hybrid dual integral equations ................................................................. 133

§20. Systems of triple integral equations with the generalized associated
Legendre functions of the first kind $P_{-1/2+n}^m(ch\alpha)$ ................................................................. 137

§21. On a property of the fractional Riemann-Liouville integral of $P_{k,n}^m(z)$ ....... 144

§22. On some generalized integral operators of Buschman-Erdélyi's type .......... 147

§23. Factorization of integral operators with the generalized associated Legendre
functions and its application for solving integral equations ......................... 152

§24. Some generalizations of integral transforms of Mehler-Fock type and
their applications ................................................................. 160

§25. Examples of the integrals involving the generalized associated Legendre
functions ................................................................. 171

Appendix. The hypergeometric function ................................................................. 175

Bibliography ................................................................. 183

Subject index ................................................................. 193