APPENDIX

Appendix-A

$$B = -[(1 + l) + \sigma_0]^{m_1 - m_2}$$

$$c_1 = \frac{(1 + l)}{i(1 + l^2)}(m_1 - 1)$$

$$c_2 = \frac{(1 + l)}{i(1 + l^2)}(m_2 - 1)B$$

$$c_3 = \frac{iN^2}{N_0^2}; \qquad\qquad c_4 = \frac{iN^2}{N_0^2}B$$

$$c_5 = -c_1 + i; \qquad\qquad c_6 = -c_2 + iB$$

$$c_7 = -lc_1 + i; \qquad\qquad c_8 = -lc_2 + iB$$

$$c_9 = \frac{i\,Hx + i\,l\,Hz}{(1 + l)^2(m_1 + 1)(m_1 + 2)}$$

$$c_{10} = \frac{i\,Hx + i\,l\,Hz}{(1 + l)^2(m_2 + 1)(m_2 + 2)}B$$

$$c_{11} = -i\,l\,Hx\,c_7 + i\,l\,Hz\,c_5 - (1 + l)Hx\,m_1$$

$$c_{12} = -i\,l\,Hx\,c_8 + i\,l\,Hz\,c_6 - (1 + l)Hx\,m_2\,B$$

$$c_{13} = \frac{c_{11}}{(1 + l)^2 m_1(m_1 + 1)}$$

$$c_{14} = \frac{c_{12}}{(1 + l)^2 m_2(m_2 + 1)}$$

$$c_{15} = i\,Hx\,c_7 - i\,Hz\,c_5 - (1 + l)Hz\,m_1$$

$$c_{16} = i\,Hx\,c_8 - i\,Hz\,c_6 - (1 + l)Hz\,m_2\,B$$

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$$c_{17} = \frac{c_{15}}{(1+l)^2 m_1 (m_1 + 1)}$$

$$c_{18} = \frac{c_{16}}{(1+l)^2 m_2 (m_2 + 1)}$$

$$c_{19} = \frac{(1+l^2) Ri\ N^2}{(1+l)^2 N_0^2}$$

$$c_{20} = \frac{m_1 (m_1 - 1)}{(m_1 - 1)^2 - (m_1 - 1) + c_{19}}$$

$$c_{21} = \frac{m_2 (m_2 - 1)B}{(m_2 - 1)^2 - (m_2 - 1) + c_{19}}$$

$$c_{22} = \frac{i\ Hx\ (m_1 + 1) c_{13}}{(1+l)((m_1 + 1)^2 - (m_1 + 1) + c_{19})}$$

$$c_{23} = \frac{i\ Hx\ (m_2 + 1) c_{14}}{(1+l)((m_2 + 1)^2 - (m_2 + 1) + c_{19})}$$

$$c_{24} = \frac{i\ Hz\ l^2 (m_1 + 1) c_{17}}{(1+l)((m_1 + 1)^2 - (m_1 + 1) + c_{19})}$$

$$c_{25} = \frac{i\ Hz\ l^2 (m_2 + 1) c_{18}}{(1+l)((m_2 + 1)^2 - (m_2 + 1) + c_{19})}$$

$$c_{26} = \frac{i\ (1+l^2) c_3}{(1+l)^2 ((m_1 - 1)^2 - (m_1 - 1) + c_{19})}$$

$$c_{27} = \frac{i\ (1+l^2) c_4}{(1+l)^2 ((m_2 - 1)^2 - (m_2 - 1) + c_{19})}$$

$$c_{28} = c_{22} + c_{24}; \qquad c_{29} = c_{23} + c_{25}$$

Appendix

$$c_{30} = (1 + l) - \sigma_0; \qquad c_{31} = -(1 + l) - \sigma_0$$

$$c_{32} = c_{30}^{m_2} c_{31}^{m_1} - c_{31}^{m_2} c_{30}^{m_1}$$

$$c_{33} = c_{28}\left(c_{30}^{m_1+1} c_{31}^{m_1} - c_{31}^{m_1+1} c_{30}^{m_1}\right)$$

$$+ c_{29}\left(c_{30}^{m_2+1} c_{31}^{m_1} - c_{31}^{m_2+1} c_{30}^{m_1}\right)$$

$$c_{34} = c_{26}\left(c_{30}^{m_1-1} c_{31}^{m_1} - c_{31}^{m_1-1} c_{30}^{m_1}\right)$$

$$+ c_{27}\left(c_{30}^{m_2-1} c_{31}^{m_1} - c_{31}^{m_2-1} c_{30}^{m_1}\right)$$

$$c_{35} = c_{20}\left(c_{30}^{m_1-1} c_{31}^{m_1} - c_{31}^{m_1-1} c_{30}^{m_1}\right)$$

$$+ c_{21}\left(c_{30}^{m_2-1} c_{31}^{m_1} - c_{31}^{m_2-1} c_{30}^{m_1}\right)$$

$$c_{36} = \frac{c_{33}}{c_{32}}; \quad c_{37} = \frac{c_{34}}{c_{32}}; \quad c_{38} = \frac{c_{35}}{c_{32}}$$

$$c_{39} = c_{30}^{m_1} c_{31}^{m_2} - c_{31}^{m_1} c_{30}^{m_2}$$

$$c_{40} = c_{28}\left(c_{30}^{m_1+1} c_{31}^{m_2} - c_{31}^{m_1+1} c_{30}^{m_2}\right)$$

$$+ c_{29}\left(c_{30}^{m_2+1} c_{31}^{m_2} - c_{31}^{m_2+1} c_{30}^{m_2}\right)$$

$$c_{41} = c_{26}\left(c_{30}^{m_1-1} c_{31}^{m_2} - c_{31}^{m_1-1} c_{30}^{m_2}\right)$$

$$+ c_{27}\left(c_{30}^{m_2-1} c_{31}^{m_2} - c_{31}^{m_2-1} c_{30}^{m_2}\right)$$

$$c_{42} = c_{20}\left(c_{30}^{m_1-1} c_{31}^{m_2} - c_{31}^{m_1-1} c_{30}^{m_2}\right)$$

$$+ c_{21}\left(c_{30}^{m_2-1} c_{31}^{m_2} - c_{31}^{m_2-1} c_{30}^{m_2}\right)$$

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$$c_{43} = \frac{c_{40}}{c_{39}}; \qquad c_{43} = \frac{c_{41}}{c_{39}}; \qquad c_{45} = \frac{c_{42}}{c_{39}}$$

$$c_{46} = c_{43}\, c_{30}^{m_1} + c_{36}\, c_{30}^{m_2}$$

$$-c_{28}\, c_{30}^{m_1+1} - c_{29}\, c_{30}^{m_2+1}$$

$$c_{47} = c_{44}\, c_{30}^{m_1} + c_{37}\, c_{30}^{m_2}$$

$$-c_{26}\, c_{30}^{m_1-1} - c_{27}\, c_{30}^{m_2-1}$$

$$c_{48} = c_{45}\, c_{30}^{m_1} + c_{38}\, c_{30}^{m_2}$$

$$-c_{20}\, c_{30}^{m_1-1} - c_{21}\, c_{30}^{m_2-1}$$

$$c_{49} = -c_3\, c_{43}; \qquad c_{50} = -c_3\, c_{44}$$

$$c_{51} = -c_3\, c_{45}; \qquad c_{52} = -c_3\, c_{36}$$

$$c_{53} = -c_3\, c_{37}; \qquad c_{54} = -c_3\, c_{38}$$

$$c_{55} = -c_3\, c_{28}; \qquad c_{56} = -c_3\, c_{29}$$

$$c_{57} = -c_3\, c_{26}; \qquad c_{58} = -c_3(\,c_{27} - 1)$$

$$c_{59} = -c_3\, c_{20}; \qquad c_{60} = -c_3\, c_{21} + c_4$$

$$c_{61} = \frac{-m_1(1+l)}{i(1+l^2)}; \qquad c_{62} = \frac{-B\, m_2(1+l)}{i(1+l^2)}$$

$$c_{63} = \frac{(Hz - l\, Hx)(c_{17} - l\, c_{13})}{(1+l^2)}$$

$$c_{64} = \frac{(Hz - l\, Hx)(c_{18} - l\, c_{14})}{(1+l^2)}$$

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$$c_{65} = \frac{(1 + l)(m_1 - 1)c_{43}}{i(1 + l^2)}$$

$$c_{66} = \frac{(1 + l)(m_1 - 1)c_{44}}{i(1 + l^2)}$$

$$c_{67} = \frac{(1 + l)(m_1 - 1)c_{45}}{i(1 + l^2)}$$

$$c_{68} = \frac{(1 + l)(m_2 - 1)c_{36}}{i(1 + l^2)}$$

$$c_{69} = \frac{(1 + l)(m_2 - 1)c_{37}}{i(1 + l^2)}$$

$$c_{70} = \frac{(1 + l)(m_2 - 1)c_{38}}{i(1 + l^2)}$$

$$c_{71} = \frac{(c_{63} + (1 + l)(m_1)c_{28})}{i(1 + l^2)}$$

$$c_{72} = \frac{(c_{64} + (1 + l)(m_2)c_{29})}{i(1 + l^2)}$$

$$c_{73} = \frac{(1 + l)(m_1 - 2)c_{26}}{i(1 + l^2)}$$

$$c_{74} = \frac{c_{61} + (1 + l)(m_1 - 2)c_{20}}{i(1 + l^2)}$$

$$c_{75} = \frac{(1 + l)(m_2 - 2)c_{27}}{i(1 + l^2)}$$

$$c_{76} = \frac{c_{62} + (1 + l)(m_2 - 2)c_{21}}{i(1 + l^2)}$$

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$$c_{77} = ic_{43} - c_{65}; \qquad c_{78} = ic_{44} - c_{66}$$

$$c_{79} = ic_{45} - c_{67}; \qquad c_{80} = ic_{36} - c_{68}$$

$$c_{81} = ic_{37} - c_{69}; \qquad c_{82} = ic_{38} - c_{70}$$

$$c_{83} = ic_{28} - c_{71} + Hz \, (c_{17} - lc_{13})$$

$$c_{84} = ic_{29} - c_{72} + Hz \, (c_{18} - lc_{14})$$

$$c_{85} = ic_{26} - c_{73}; \qquad c_{86} = c_5 - c_{61}$$

$$c_{87} = ic_{27} - c_{75}; \qquad c_{88} = c_6 - c_{62}$$

$$c_{89} = -l \, c_{65} + ic_{43}; \qquad c_{90} = -l \, c_{66} + ic_{44}$$

$$c_{91} = -l \, c_{67} + ic_{45}; \qquad c_{92} = -l \, c_{68} + ic_{36}$$

$$c_{93} = -l \, c_{69} + ic_{37}; \qquad c_{94} = -l \, c_{70} + ic_{38}$$

$$c_{95} = ic_{28} - l \, c_{71} - Hx \, (c_{17} - lc_{13})$$

$$c_{96} = ic_{29} - l \, c_{72} - Hx \, (c_{18} - lc_{14})$$

$$c_{97} = -l \, c_{73} + ic_{26}; \quad c_{98} = -l \, c_{74} + ic_{20} + c_7$$

$$c_{99} = -l \, c_{75} + ic_{27}; \quad c_{100} = -l \, c_{76} + ic_{21} + c_8$$

$$c_{101} = \frac{(i \, Hx + i \, l \, Hz)c_{43}}{(1 + l)^2 (m_1 + 1)(m_1 + 2)}$$

$$c_{102} = \frac{(i \, Hx + i \, l \, Hz)c_{44}}{(1 + l)^2 (m_1 + 1)(m_1 + 2)}$$

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$$c_{103} = \frac{(i\,Hx + i\,l\,Hz)c_{45}}{(1 + l)^2(m_1 + 1)(m_1 + 2)}$$

$$c_{104} = \frac{(i\,Hx + i\,l\,Hz)c_{36}}{(1 + l)^2(m_2 + 1)(m_2 + 2)}$$

$$c_{105} = \frac{(i\,Hx + i\,l\,Hz)c_{37}}{(1 + l)^2(m_2 + 1)(m_2 + 2)}$$

$$c_{106} = \frac{(i\,Hx + i\,l\,Hz)c_{38}}{(1 + l)^2(m_2 + 1)(m_2 + 2)}$$

$$c_{107} = \frac{-(i\,Hx + i\,l\,Hz)c_{28}}{(1 + l)^2(m_1 + 2)(m_1 + 3)}$$

$$c_{108} = \frac{-(i\,Hx + i\,l\,Hz)c_{29}}{(1 + l)^2(m_2 + 2)(m_2 + 3)}$$

$$c_{109} = \frac{(i\,Hx + i\,l\,Hz)c_{26}}{(1 + l)^2(m_1)(m_1 + 1)}$$

$$c_{110} = \frac{(i\,Hx + i\,l\,Hz)c_{20}}{(1 + l)^2(m_1)(m_1 + 1)}$$

$$c_{111} = \frac{(i\,Hx + i\,l\,Hz)c_{27}}{(1 + l)^2(m_2)(m_2 + 1)}$$

$$c_{112} = \frac{(i\,Hx + i\,l\,Hz)c_{21}}{(1 + l)^2(m_2)(m_2 + 1)}$$

$$c_{113} = \frac{-i\,c_9}{(1 + l)^2(m_1 + 4)(m_1 + 5)}$$

$$c_{114} = \frac{-i\,c_{10}}{(1 + l)^2(m_2 + 4)(m_2 + 5)}$$

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$$c_{115} = \frac{(i\,Hx + i\,l\,Hz)c_{86}}{(1+l)^2(m_1)(m_1 - 1)}$$

$$c_{116} = \frac{(i\,Hx + i\,l\,Hz)c_{85}}{(1+l)^2(m_1)(m_1 - 1)}$$

$$c_{117} = \frac{(i\,Hx + i\,l\,Hz)c_{88}}{(1+l)^2(m_2)(m_2 - 1)}$$

$$c_{118} = \frac{(i\,Hx + i\,l\,Hz)c_{87}}{(1+l)^2(m_2)(m_2 - 1)}$$

$$c_{119} = \frac{(i\,Hx + i\,l\,Hz)c_{77}}{(1+l)^2(m_1)(m_1 + 1)}$$

$$c_{120} = \frac{(i\,Hx + i\,l\,Hz)c_{78}}{(1+l)^2(m_1)(m_1 + 1)}$$

$$c_{121} = \frac{(i\,Hx + i\,l\,Hz)c_{79}}{(1+l)^2(m_1)(m_1 + 1)}$$

$$c_{122} = \frac{(i\,Hx + i\,l\,Hz)c_{80}}{(1+l)^2(m_2)(m_2 + 1)}$$

$$c_{123} = \frac{(i\,Hx + i\,l\,Hz)c_{81}}{(1+l)^2(m_2)(m_2 + 1)}$$

$$c_{124} = \frac{(i\,Hx + i\,l\,Hz)c_{82}}{(1+l)^2(m_2)(m_2 + 1)}$$

$$c_{125} = \frac{-(i\,Hx + i\,l\,Hz)c_{83}}{(1+l)^2(m_1 + 1)(m_1 + 2)}$$

$$c_{126} = \frac{-(i\,Hx + i\,l\,Hz)c_{84}}{(1+l)^2(m_1 + 1)(m_1 + 2)}$$

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$$c_{127} = \frac{c_9 - i\,c_{13}}{(1 + l)^2(m_1 + 3)(m_1 + 4)}$$

$$c_{128} = \frac{c_{10} - i\,c_{14}}{(1 + l)^2(m_2 + 3)(m_2 + 4)}$$

$$c_{129} = \frac{(i\,Hx + i\,l\,Hz)c_{98}}{(1 + l)^2(m_1)(m_1 - 1)}$$

$$c_{130} = \frac{(i\,Hx + i\,l\,Hz)c_{97}}{(1 + l)^2(m_1)(m_1 - 1)}$$

$$c_{131} = \frac{(i\,Hx + i\,l\,Hz)c_{100}}{(1 + l)^2(m_2)(m_2 - 1)}$$

$$c_{132} = \frac{(i\,Hx + i\,l\,Hz)c_{99}}{(1 + l)^2(m_2)(m_2 - 1)}$$

$$c_{133} = \frac{(i\,Hx + i\,l\,Hz)c_{99}}{(1 + l)^2(m_1)(m_1 + 1)}$$

$$c_{134} = \frac{(i\,Hx + i\,l\,Hz)c_{90}}{(1 + l)^2(m_1)(m_1 + 1)}$$

$$c_{135} = \frac{(i\,Hx + i\,l\,Hz)c_{91}}{(1 + l)^2(m_1)(m_1 + 1)}$$

$$c_{136} = \frac{(i\,Hx + i\,l\,Hz)c_{92}}{(1 + l)^2(m_2)(m_2 + 1)}$$

$$c_{137} = \frac{(i\,Hx + i\,l\,Hz)c_{93}}{(1 + l)^2(m_2)(m_2 + 1)}$$

$$c_{138} = \frac{(i\,Hx + i\,l\,Hz)c_{94}}{(1 + l)^2(m_2)(m_2 + 1)}$$

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$$c_{139} = \frac{-(i\,Hx + i\,l\,Hz)c_{95}}{(1+l)^2(m_1+1)(m_1+2)}$$

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$$c_{140} = \frac{-(i\,Hx + i\,l\,Hz)c_{96}}{(1+l)^2(m_2+1)(m_2+2)}$$

$$c_{141} = \frac{i\,c_{17} - c_9}{(1+l)^2(m_1+3)(m_1+4)}$$

$$c_{142} = \frac{i\,c_{18} - c_{10}}{(1+l)^2(m_2+3)(m_2+4)}$$

$$c_{143} = \frac{c_{30}^{m_1-1}c_{31}^{m_2} - c_{31}^{m_1-1}c_{30}^{m_2}}{c_{39}}$$

$$c_{144} = \frac{c_{30}^{m_2-1}c_{31}^{m_2} - c_{31}^{m_2-1}c_{30}^{m_2}}{c_{39}}$$

$$c_{145} = 1;$$

$$c_{146} = \frac{c_{30}^{m_1-2}c_{31}^{m_2} - c_{31}^{m_1-2}c_{30}^{m_2}}{c_{39}}$$

$$c_{147} = \frac{c_{30}^{m_2-2}c_{31}^{m_2} - c_{31}^{m_2-2}c_{30}^{m_2}}{c_{39}}$$

$$c_{148} = \frac{c_{30}^{m_1+1}c_{31}^{m_2} - c_{31}^{m_1+1}c_{30}^{m_2}}{c_{39}}$$

$$c_{149} = \frac{c_{30}^{m_2+1}c_{31}^{m_2} - c_{31}^{m_2+1}c_{30}^{m_2}}{c_{39}}$$

$$c_{150} = \frac{c_{30}^{m_1+2}c_{31}^{m_2} - c_{31}^{m_1+2}c_{30}^{m_2}}{c_{39}}$$

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$$c_{151} = \frac{c_{30}^{m_2+2} c_{31}^{m_2} - c_{31}^{m_2+2} c_{30}^{m_2}}{c_{39}}$$

$$c_{152} = \frac{c_{30}^{m_1+4} c_{31}^{m_2} - c_{31}^{m_1+4} c_{30}^{m_2}}{c_{39}}$$

$$c_{153} = \frac{c_{30}^{m_2+4} c_{31}^{m_2} - c_{31}^{m_2+4} c_{30}^{m_2}}{c_{39}}$$

$$c_{154} = \frac{c_{30}^{m_1-1} c_{31}^{m_2} - c_{31}^{m_1-1} c_{30}^{m_2}}{c_{32}}$$

$$c_{155} = \frac{c_{30}^{m_2-1} c_{31}^{m_2} - c_{31}^{m_2-1} c_{30}^{m_2}}{c_{32}}$$

$$c_{156} = 1;$$

$$c_{157} = \frac{c_{30}^{m_1-2} c_{31}^{m_2} - c_{31}^{m_1-2} c_{30}^{m_2}}{c_{32}}$$

$$c_{158} = \frac{c_{30}^{m_2-2} c_{31}^{m_2} - c_{31}^{m_2-2} c_{30}^{m_2}}{c_{32}}$$

$$c_{159} = \frac{c_{30}^{m_1+1} c_{31}^{m_2} - c_{31}^{m_1+1} c_{30}^{m_2}}{c_{32}}$$

$$c_{160} = \frac{c_{30}^{m_2+1} c_{31}^{m_2} - c_{31}^{m_2+1} c_{30}^{m_2}}{c_{32}}$$

$$c_{161} = \frac{c_{30}^{m_1+2} c_{31}^{m_2} - c_{31}^{m_1+2} c_{30}^{m_2}}{c_{32}}$$

$$c_{162} = \frac{c_{30}^{m_2+2} c_{31}^{m_2} - c_{31}^{m_2+2} c_{30}^{m_2}}{c_{32}}$$

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$$c_{163} = \frac{c_{30}^{m_1+4} c_{31}^{m_2} - c_{31}^{m_1+4} c_{30}^{m_2}}{c_{32}}$$

$$c_{164} = \frac{c_{30}^{m_2+4} c_{31}^{m_2} - c_{31}^{m_2+4} c_{30}^{m_2}}{c_{32}}$$

$$c_{165} = -c_{143} c_{30}^{m_1} - c_{154} c_{30}^{m_2} + c_{30}^{m_1-1}$$

$$c_{166} = -c_{144} c_{30}^{m_1} - c_{155} c_{30}^{m_2} + c_{30}^{m_2-1}$$

$$c_{167} = -c_{145} c_{30}^{m_1} + c_{30}^{m_1};$$

$$c_{168} = -c_{156} c_{30}^{m_1} + c_{30}^{m_2}$$

$$c_{169} = -c_{147} c_{30}^{m_1} - c_{157} c_{30}^{m_2} + c_{30}^{m_1-2}$$

$$c_{170} = -c_{148} c_{30}^{m_1} - c_{158} c_{30}^{m_2} + c_{30}^{m_2-2}$$

$$c_{171} = -c_{149} c_{30}^{m_1} - c_{159} c_{30}^{m_2} + c_{30}^{m_1+1}$$

$$c_{172} = -c_{149} c_{30}^{m_1} - c_{160} c_{30}^{m_2} + c_{30}^{m_2+1}$$

$$c_{173} = -c_{150} c_{30}^{m_1} - c_{161} c_{30}^{m_2} + c_{30}^{m_1+2}$$

$$c_{174} = -c_{151} c_{30}^{m_1} - c_{162} c_{30}^{m_2} + c_{30}^{m_2+2}$$

$$c_{175} = -c_{152} c_{30}^{m_1} - c_{163} c_{30}^{m_2} + c_{30}^{m_1+4}$$

$$c_{176} = -c_{153} c_{30}^{m_1} - c_{164} c_{30}^{m_2} + c_{30}^{m_2+4}$$

$$c_{177} = \frac{m_1(m_1 - 1)c_{43}c_{165}}{(m_1 - 1)^2 - (m_1 - 1) + c_{19}}$$

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$$c_{178} = \frac{m_1(m_1 - 1)c_{44}c_{165}}{(m_1 - 1)^2 - (m_1 - 1) + c_{19}}$$

$$c_{179} = \frac{m_1(m_1 - 1)c_{45}c_{165}}{(m_1 - 1)^2 - (m_1 - 1) + c_{19}}$$

$$c_{180} = \frac{m_1(m_1 - 1)c_{165}}{(m_1 - 1)^2 - (m_1 - 1) + c_{19}}$$

$$c_{181} = \frac{i\,(1 + l^2)c_{49}c_{165}}{(1 + l)^2((m_1 - 1)^2 - (m_1 - 1) + c_{19})}$$

$$c_{182} = \frac{i\,(1 + l^2)c_{50}c_{165}}{(1 + l)^2((m_1 - 1)^2 - (m_1 - 1) + c_{19})}$$

$$c_{183} = \frac{i\,(1 + l^2)}{(1 + l)^2((m_1 - 1)^2 - (m_1 - 1) + c_{19})}$$

$$c_{184} = \frac{i\,(1 + l^2)c_3 c_{165}}{(1 + l)^2((m_1 - 1)^2 - (m_1 - 1) + c_{19})}$$

$$c_{185} = \frac{m_2(m_2 - 1)c_{36}c_{166}}{(m_2 - 1)^2 - (m_2 - 1) + c_{19}}$$

$$c_{186} = \frac{m_2(m_2 - 1)c_{37}c_{166}}{(m_2 - 1)^2 - (m_2 - 1) + c_{19}}$$

$$c_{187} = \frac{m_2(m_2 - 1)c_{38}c_{166}}{(m_2 - 1)^2 - (m_2 - 1) + c_{19}}$$

$$c_{188} = \frac{m_2(m_2 - 1)c_{166}}{(m_2 - 1)^2 - (m_2 - 1) + c_{19}}$$

$$c_{189} = \frac{i\,(1 + l^2)c_{52}c_{166}}{(1 + l)^2((m_2 - 1)^2 - (m_2 - 1) + c_{19})}$$

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$$c_{190} = \frac{i\,(1 + l^2)c_{53}c_{166}}{(1 + l)^2((m_2 - 1)^2 - (m_2 - 1) + c_{19})}$$

$$c_{191} = \frac{i\,(1 + l^2)c_{54}c_{166}}{(1 + l)^2((m_2 - 1)^2 - (m_2 - 1) + c_{19})}$$

$$c_{192} = \frac{i\,(1 + l^2)c_4c_{166}}{(1 + l)^2((m_2 - 1)^2 - (m_2 - 1) + c_{19})}$$

$$c_{193} = \frac{m_1(m_1 + 1)c_{28}c_{167}}{m_1{}^2 - m_1 + c_{19}}$$

$$c_{194} = \frac{i\,(1 + l^2)c_{55}c_{167}}{(1 + l)^2(m_1{}^2 - m_1 + c_{19})}$$

$$p_1 = \frac{i[Hz\,l\,(1 - l) + Hx(1 + l^2)]}{(1 + l)}$$

$$p_2 = \frac{i[-Hz\,(1 - l) + Hz\,(1 + l^2)]}{(1 + l)}$$

$$c_{195} = \frac{p_1 m_1 c_{115}c_{167}}{(m_1{}^2 - m_1 + c_{19}}$$

$$c_{196} = \frac{p_1 m_1 c_{116}c_{167}}{m_1{}^2 - m_1 + c_{19}}$$

$$c_{197} = \frac{p_2 m_1 c_{129}c_{167}}{m_1{}^2 - m_1 + c_{19}}$$

$$c_{198} = \frac{p_2 m_1 c_{130}c_{167}}{m_1{}^2 - m_1 + c_{19}}$$

$$c_{199} = \frac{m_2(m_2 + 1)c_{29}c_{168}}{m_2{}^2 - m_2 + c_{19}}$$

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$$c_{200} = \frac{i\,(1+l^2)c_{56}c_{168}}{(1+l)^2(m_2{}^2 - m_2 + c_{19})}$$

$$c_{201} = \frac{p_1 m_2 c_{117} c_{168}}{m_2{}^2 - m_2 + c_{19}}$$

$$c_{202} = \frac{p_1 m_2 c_{118} c_{168}}{m_2{}^2 - m_2 + c_{19}}$$

$$c_{203} = \frac{p_2 m_2 c_{131} c_{168}}{m_2{}^2 - m_2 + c_{19}}$$

$$c_{204} = \frac{p_2 m_2 c_{132} c_{168}}{m_2{}^2 - m_2 + c_{19}}$$

$$c_{205} = \frac{(m_1 - 1)(m_1 - 2)c_{26}c_{169}}{(m_1 - 2)^2 - (m_1 - 2) + c_{19}}$$

$$c_{206} = \frac{c_{20}(m_1 - 1)(m_1 - 2)c_{169}}{(m_1 - 2)^2 - (m_1 - 2) + c_{19}}$$

$$c_{207} = \frac{i\,(1+l^2)c_{57}c_{169}}{(1+l)^2((m_1 - 2)^2 - (m_1 - 2) + c_{19})}$$

$$c_{208} = \frac{i\,(1+l^2)c_3 c_{169}}{(1+l)^2((m_1 - 2)^2 - (m_1 - 2) + c_{19})}$$

$$c_{209} = \frac{(m_2 - 1)(m_2 - 2)c_{27}c_{170}}{((m_2 - 2)^2 - (m_2 - 2) + c_{19})}$$

$$c_{210} = \frac{c_{20}(m_2 - 1)(m_2 - 2)c_{170}}{(m_2 - 2)^2 - (m_2 - 2) + c_{19}}$$

$$c_{211} = \frac{i\,(1+l^2)c_{59}c_{170}}{(1+l)^2((m_2 - 2)^2 - (m_2 - 2) + c_{19})}$$

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$$c_{212} = \frac{i\,(1+l^2)c_4c_{170}}{(1+l)^2((m_2-2)^2-(m_2-2)+c_{19})}$$

$$c_{213} = \frac{p_1(m_1+1)c_{119}c_{171}}{(m_1+1)^2-(m_1+1)+c_{19}}$$

$$c_{214} = \frac{p_1(m_1+1)c_{120}c_{171}}{(m_1+1)^2-(m_1+1)+c_{19}}$$

$$c_{215} = \frac{p_1(m_1+1)c_{121}c_{171}}{(m_1+1)^2-(m_1+1)+c_{19}}$$

$$c_{216} = \frac{p_2(m_1+1)c_{133}c_{171}}{(m_1+1)^2-(m_1+1)+c_{19}}$$

$$c_{217} = \frac{p_2(m_1+1)c_{134}c_{171}}{(m_1+1)^2-(m_1+1)+c_{19}}$$

$$c_{218} = \frac{p_2(m_1+1)c_{135}c_{171}}{(m_1+1)^2-(m_1+1)+c_{19}}$$

$$c_{219} = \frac{p_1(m_2+1)c_{122}c_{172}}{(m_2+1)^2-(m_2+1)+c_{19}}$$

$$c_{220} = \frac{p_1(m_2+1)c_{123}c_{172}}{(m_2+1)^2-(m_2+1)+c_{19}}$$

$$c_{221} = \frac{p_1(m_2+1)c_{124}c_{172}}{(m_2+1)^2-(m_2+1)+c_{19}}$$

$$c_{222} = \frac{p_2(m_2+1)c_{136}c_{172}}{(m_2+1)^2-(m_2+1)+c_{19}}$$

$$c_{223} = \frac{p_2(m_2+1)c_{137}c_{172}}{(m_2+1)^2-(m_2+1)+c_{19}}$$

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$$c_{224} = \frac{p_2(m_2 + 1)c_{138}c_{172}}{(m_2 + 1)^2 - (m_2 + 1) + c_{19}}$$

$$c_{225} = \frac{p_1(m_1 + 2)c_{125}c_{173}}{(m_1 + 2)^2 - (m_1 + 2) + c_{19}}$$

$$c_{226} = \frac{p_2(m_1 + 2)c_{139}c_{173}}{(m_1 + 2)^2 - (m_1 + 2) + c_{19}}$$

$$c_{227} = \frac{p_1(m_2 + 2)c_{126}c_{174}}{(m_2 + 2)^2 - (m_2 + 2) + c_{19}}$$

$$c_{228} = \frac{p_2(m_2 + 2)c_{140}c_{174}}{(m_2 + 2)^2 - (m_2 + 2) + c_{19}}$$

$$c_{229} = \frac{p_1(m_1 + 4)c_{127}c_{175}}{(m_1 + 4)^2 - (m_1 + 4) + c_{19}}$$

$$c_{230} = \frac{p_2(m_1 + 4)c_{141}c_{175}}{(m_1 + 4)^2 - (m_1 + 4) + c_{19}}$$

$$c_{231} = \frac{p_1(m_2 + 4)c_{128}c_{176}}{(m_2 + 4)^2 - (m_2 + 4) + c_{19}}$$

$$c_{232} = \frac{p_2(m_2 + 4)c_{142}c_{176}}{(m_2 + 4)^2 - (m_2 + 4) + c_{19}}$$

$$c_{233} = c_{177} + c_{185} - c_{193} - c_{195} - c_{197}$$

$$-c_{199} - c_{201} - c_{203} + c_{215} - c_{218}$$

$$+c_{221} - c_{224}$$

$$c_{234} = c_{178} + c_{185} + c_{186} + c_{191}$$

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$$-c_{205} - c_{208} - c_{209} - c_{212}$$

$$c_{235} = c_{179} + c_{187};$$

$$c_{236} = c_{180} + c_{188}$$

$$c_{237} = c_{184} + c_{192}$$

$$c_{238} = c_{181} + c_{189} - c_{194} - c_{196} - c_{198}$$

$$-c_{200} - c_{202} - c_{204} - c_{214} - c_{217}$$

$$-c_{220} - c_{223}$$

$$c_{239} = c_{182} + c_{190} - c_{207}$$

$$c_{240} = c_{213} + c_{216} + c_{219} + c_{222} - c_{225}$$

$$-c_{226} - c_{227} - c_{228} - c_{229} - c_{230}$$

$$-c_{231} - c_{232}$$

Appendix

Appendix-B

$$r \quad = \quad (\eta R \cos \alpha)^{\frac{1}{4}}$$

$$dr \quad = \quad \sinh r \cos r + \cosh r \sin r$$

$$C_1 \quad = \quad \frac{r}{Pr} \frac{\tan \alpha \sin r}{dr}$$

$$C_2 \quad = \quad -\frac{r}{Pr} \frac{\tan \alpha \sinh r}{dr}$$

$$C_3 \quad = \quad -\frac{\eta}{r} \frac{\tan \alpha \sin r}{dr}$$

$$C_4 \quad = \quad -\frac{\eta}{r} \frac{\tan \alpha \sinh r}{dr}$$

$$C_5 \quad = \quad \eta \tan \alpha$$

$$w_0 \quad = \quad C_1 \sinh(rx) + C_2 \sin(rx)$$

$$\theta_0 \quad = \quad C_3 \sinh(rx) + C_4 \sin(rx) + C_5 x$$

$$R_1 \quad = \quad \left[\frac{\lambda_0(1+Pr) + \sqrt{\lambda_0^2(1-Pr)^2 + 4R \cos \alpha}}{2} \right]^{\frac{1}{2}}$$

$$R_2 \quad = \quad \left[\frac{\lambda_0(1+Pr) + \sqrt{\lambda_0^2(1-Pr)^2 + 4R \cos \alpha}}{2} \right]^{\frac{1}{2}}$$

$$A_1 \quad = \quad -\frac{\cosh(R_1)}{\cosh(R_2)}$$

$$\varphi_0(x) \quad = \quad \cosh(R_1 x) + A_1 \cosh(R_2 x)$$

$$C_8 \quad = \quad \frac{R_1}{Pr^{-1}R_1^2 - \lambda_0}$$

$$C_9 \quad = \quad \frac{R_2}{Pr^{-1}R_2^2 - \lambda_0} A_1$$

$$C_{9a} \quad = \quad -\frac{1}{\sqrt{Pr\lambda_0}\cosh(\sqrt{Pr\lambda_0})}$$

$$A_2 \quad = \quad C_{9a}(C_8 R_1 \cosh(R_1) + C_9 R_2 \cosh(R_2))$$

$$t_0 \quad = \quad A_2 \sinh(\sqrt{Pr\lambda_0}x) + A_3 \sinh(R_1 x) + A_4 \sinh(R_2 x)$$

$$C_{10} \quad = \quad C_1(R_1^2 - r^2)$$

$$C_{11} \quad = \quad C_2(R_1^2 + R_2^2)$$

$$C_{12} \quad = \quad A_1 C_1(R_1^2 - r^2)$$

$$C_{13} \quad = \quad A_1 C_2(R_1^2 + r^2)$$

$$C_{20} \quad = \quad C_3$$

$$C_{21} \quad = \quad C_4$$

$$C_{22} \quad = \quad C_{18}\left(\frac{R_1^2 - r^2}{2}\right)[(r + R_1)^2 - \lambda_0]$$

$$C_{23} \quad = \quad C_{18}\left(\frac{R_1^2 - r^2}{2}\right)[(r - R_1)^2 - \lambda_0]$$

$$C_{24} \quad = \quad C_{18}A_1\left(\frac{R_2^2 - r^2}{2}\right)[(r + R_2)^2 - \lambda_0]$$

$$C_{25} \quad = \quad C_{18}A_1\left(\frac{R_2^2 - r^2}{2}\right)[(r - R_2)^2 - \lambda_0]$$

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$$C_{26} = C_{19}\left(\frac{R_1^2+r^2}{2}\right)[(r+iR_1)^2 - \lambda_0]$$

$$C_{27} = C_{19}\left(\frac{R_1^2+r^2}{2}\right)[(r-iR_1)^2 - \lambda_0]$$

$$C_{28} = C_{19}A_1\left(\frac{R_2^2+r^2}{2}\right)[(r+iR_1)^2 - \lambda_0]$$

$$C_{29} = C_{19}A_1\left(\frac{R_2^2+r^2}{2}\right)[(r-iR_1)^2 - \lambda_0]$$

$$C_{30} = iRPr^{-1}R_1\sin\alpha$$

$$C_{31} = iRPr^{-1}A_1R_2\sin\alpha$$

$$C_{32} = \frac{C_{20}r}{2}(r+R_1)iRPr^{-1}\cos\alpha$$

$$C_{33} = \frac{C_{20}r}{2}(r-R_1)iRPr^{-1}\cos\alpha$$

$$C_{34} = \frac{C_{21}r}{2}(r+iR_1)iRPr^{-1}\cos\alpha$$

$$C_{35} = \frac{C_{21}r}{2}(r-iR_1)iRPr^{-1}\cos\alpha$$

$$C_{36} = \frac{C_{20}rA_1}{2}(r+R_2)iRPr^{-1}\cos\alpha$$

$$C_{37} = \frac{C_{20}rA_1}{2}(r-R_2)iRPr^{-1}\cos\alpha$$

$$C_{38} = \frac{C_{21}rA_1}{2}(r+iR_2)iRPr^{-1}\cos\alpha$$

$$C_{39} = \frac{C_{21}rA_1}{2}(r-iR_2)iRPr^{-1}\cos\alpha$$

$$C_{40} = \frac{C_{18}A_2}{2}\left(r+\sqrt{Pr\lambda_0}\right)iRPr^{-1}\cos\alpha$$

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$$C_{41} = -\frac{C_{18}A_2}{2}\left(r - \sqrt{Pr\lambda_0}\right)iRPr^{-1}\cos\alpha$$

$$C_{42} = \frac{C_{19}A_2 i}{2}\left(r - i\sqrt{Pr\lambda_0}\right)iRPr^{-1}\cos\alpha$$

$$C_{43} = -\frac{C_{19}A_2 i}{2}\left(r + i\sqrt{Pr\lambda_0}\right)iRPr^{-1}\cos\alpha$$

$$C_{44} = \frac{C_{18}A_3}{2}\left(r + R_1\right)iRPr^{-1}\cos\alpha$$

$$C_{45} = -\frac{C_{18}A_3}{2}\left(r - R_1\right)iRPr^{-1}\cos\alpha$$

$$C_{46} = \frac{C_{19}A_3 i}{2}\left(r - iR_1\right)iRPr^{-1}\cos\alpha$$

$$C_{47} = -\frac{C_{19}A_3 i}{2}\left(r + iR_1\right)iRPr^{-1}\cos\alpha$$

$$C_{48} = \frac{C_{18}A_4}{2}\left(r + R_2\right)iRPr^{-1}\cos\alpha$$

$$C_{49} = -\frac{C_{18}A_4}{2}\left(r - R_2\right)iRPr^{-1}\cos\alpha$$

$$C_{50} = \frac{C_{19}A_4 i}{2}\left(r - iR_2\right)iRPr^{-1}\cos\alpha$$

$$C_{51} = -\frac{C_{19}A_4 i}{2}\left(r + iR_2\right)iRPr^{-1}\cos\alpha$$

$$A_{12} = \frac{1}{R_1^2(R_2^2 - R_1^2)}\left(C_{30} + \eta\tan\alpha R_1\right)$$

$$A_{13} = \frac{1}{R_2^2(R_1^2 - R_2^2)}\left(C_{31} + \eta\tan\alpha R_2 A_1\right)$$

$$A_{14} = \frac{1}{(r+R_1)^2\left((r+R_1)^2 - R_1^2\right)\left((r+R_1)^2 - R_2^2\right)}$$

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$$A_{15} = \frac{1}{(r-R_1)^2((r-R_1)^2-R_1^2)((r-R_1)^2-R_2^2)}$$

$$A_{16} = \frac{1}{(r+R_2)^2((r+R_2)^2-R_1^2)((r+R_2)^2-R_2^2)}$$

$$A_{17} = \frac{1}{(r-R_2)^2((r+R_2)^2-R_1^2)((r+R_2)^2-R_2^2)}$$

$$A_{18} = \frac{-1}{(r+iR_1)^2((r+iR_1)^2-R_1^2)((r+iR_1)^2-R_2^2)}$$

$$A_{19} = \frac{-1}{(r-iR_1)^2((r-iR_1)^2-R_1^2)((r-iR_1)^2-R_2^2)}$$

$$A_{20} = \frac{-1}{(r+iR_2)^2((r+iR_2)^2+R_1^2)((r+iR_2)^2+R_2^2)}$$

$$A_{21} = \frac{-1}{(r+iR_2)^2((r-iR_2)^2+R_1^2)((r-iR_2)^2+R_2^2)}$$

$$A_{22} = \frac{-1}{\left(r+\sqrt{Pr\lambda_0}\right)^2\left(\left(r+\sqrt{Pr\lambda_0}\right)^2+R_1^2\right)\left(\left(r+\sqrt{Pr\lambda_0}\right)^2+R_2^2\right)}$$

$$A_{23} = \frac{-1}{\left(r-\sqrt{Pr\lambda_0}\right)^2\left(\left(r+\sqrt{Pr\lambda_0}\right)^2+R_1^2\right)\left(\left(r+\sqrt{Pr\lambda_0}\right)^2+R_2^2\right)}$$

$$A_{24} = \frac{-1}{\left(r-i\sqrt{Pr\lambda_0}\right)^2\left(\left(r+i\sqrt{Pr\lambda_0}\right)^2+R_1^2\right)\left(\left(r+i\sqrt{Pr\lambda_0}\right)^2+R_2^2\right)}$$

$$A_{25} = \frac{-1}{\left(r-i\sqrt{Pr\lambda_0}\right)^2\left(\left(r+i\sqrt{Pr\lambda_0}\right)^2-R_1^2\right)\left(\left(r+i\sqrt{Pr\lambda_0}\right)^2-R_2^2\right)}$$

$$C_{52} = -A_{12}\cosh(R_1) - A_{13}\cosh(R_2) - A_{14}\sinh(r+R_1) - A_{15}\sinh(r-R_1)$$

$$-A_{16}\sinh(r+R_2) - A_{17}\sinh(r-R_2) - A_{18}\sin(r+iR_1)$$

$$-A_{19}\sin(r-iR_1) - A_{20}\sin(r+iR_2) - A_{21}\sin(r-iR_2)$$

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$$-A_{22} \sinh\left(r + \sqrt{Pr\lambda_0}\right) - A_{23} \sinh\left(r - \sqrt{Pr\lambda_0}\right)$$

$$-A_{24} \sin\left(r - i\sqrt{Pr\lambda_0}\right) - A_{25} \sin\left(r + i\sqrt{Pr\lambda_0}\right)$$

$$C_{53} = -A_{12} \sinh(R_1) - A_{12} \cosh(R_1) - A_{13}R_2 \sinh(R_2) - A_{13} \cosh(R_2)$$

$$-A_{14}(r + R_1) \cosh(r + R_1) - A_{15}(r - R_1)\cosh(r - R_1).$$