APPENDIX

Elements of the inverse of a non singular 8 x 8 matrix i.e. $M = (z - L)^{-1}$ in equation (3.2.17). where $a = \frac{i\alpha_+}{\gamma}$, $d = \frac{i\Delta}{\gamma}$ and $g = \frac{i\Omega}{\gamma}$

$$M_{4,1} = \{(48a+96a^2+36d+192ad+48a^2d+90d^2+84ad^2+36d^3)g^3-(6+24a+24a^2+24d+48ad+24d^2)g^5+(2-16a^2+32a^4+d-24ad-8a^2d+96a^3d+16a^4d-10d^2-12ad^2+104a^2d^2+48a^3d^2-5d^3+48ad^3+52a^2d^3+8d^4+24ad^4+4d^5)gz+(-9+90a+116a^2-8a^3+63d+244ad+12a^2d+120d^2+44ad^2+24d^3)g^3z-(14+28a+28d)g^5z+(9-40a^2+16a^4+4d-60ad-16a^2d+48a^3d-25d^2-24ad^2+52a^2d^2-10d^3+24ad^3+4d^4)gz^2+(-24+56a+32a^3+33d+70ad+36d^2)g^3z^2-4g^5z^2+(16-32a^2+6d-48ad-8a^2d-20d^2-12ad^2-5d^3)gz^3+(-21+14a+6d)g^3z^3+(14-8a^2+4d-12ad-5d^2)gz^4-6g^3z^4+(6+d)gz^5+gz^6\}\frac{1}{D\Gamma}$$

$$M_{4,2} = \{(-4+32a^2-64a^4)g-(2+48a+16a^2-192a^3-32a^4)dg+(20+24a-208a^2-96a^3)d^2g+(10-96a-104a^2)d^3g-(16+48a)d^4g-8d^5g+(6+12a+8a^2+16a^3)g^3+(12+16a+48a^2)dg^3+(6+44a)d^2g^3+12d^3g^3-(8+4a+24a^2+4d+36ad+12d^2)g^5+(-20+96a^2-64a^4)gz+(-9+144a+40a^2-192a^3-16a^4)dgz+(60+60a-208a^2-48a^3)d^2gz+(25-96a-52a^2)d^3gz-(16+24a)d^4gz-4d^5gz+(21+14a+12a^2+8a^3)g^3z+(18+24a+24a^2+9d+22ad+6d^2)dg^3z-(17+2a+2d)g^5z+(-41+104a^2-16a^4-16d+156ad+32a^2-48a^3)dgz^2+(65+48a-52a^2+20d-24ad-4d^2)d^2gz^2+(27+4a^2+6d+8ad+3d^2-8g^2)g^3z^2+(-44+48a^2-14d+72ad+8a^2d)gz^3+(30+12a+5d)d^2gz^3+(15-2a)g^3z^3+(-26+8a^2-6d+12ad+5d^2+3g^2)gz^4-(8+d)gz^5-gz^6\}\frac{1}{D\Gamma}$$

$$M_{4,3} = \{(2-8a+32a^3-32a^4)48adg^2+(-4-8a+80a^2-96a^3)dg^2+(-6+64a-104a^2+16d-$$
$$-48ad-8d^2)d^2g^2-(2+24a+40a^2+20d+72ad+32d^2)g^4+(6+12a+12d)g^6+(4-20a+$$
$$24a^2+16a^3-32a^4)g^2z+(-10+24a+40a^2-96a^3+6d+32ad-104a^2d+8d^2-48ad^2-8d^3)$$
$$dg^2z+(4-28a-24a^2-22d-48ad-24d^2)g^4z+2g^6z+(-2-16a+40a^2-8d+56ad+22d^2)$$
$$g^2z^2+(12-8a-6d)g^4z^2-(10+4a-16a^2+2d-24ad-10d^2)g^2z^3+6g^4z^3-8g^2z^4-2g^2z^5\}\frac{1}{DT}$$

$$M_{4,4} = \{8-(64-128a^2)a^2+(4-96a-32a^2+384a^3+64a^4)d+(-40-48a+416a^2+192a^3)$$
$$d^2+(-20+192a+208a^2+32d+96ad+16d^2)d^3+(-10+32a+112a^2-32a^4)g^2+(20+216$$
$$a+48a^2-96a^3+102d+88ad-104a^2d+40d^2-48ad^2-8d^3)dg^2+(6-48a-24a^2-44d-$$
$$64ad-40d^2)g^4+(6+12a+12d)g^6+(44-224a^2+192a^4)z+(20-336a-96a^2+576a^3+64$$
$$a^4-140d-144ad+624a^2d+192a^3d-60d^2+288ad^2+208a^2d^2+48d^3+96ad^3+16d^4)dz+$$
$$(-52+100a+216a^2-16a^3-32a^4)g^2z+(58+424a+24a^2-96a^3+206d+88ad-104a^2d+$$
$$48d^2-48ad^2-8d^3)dg^2z+(18-76a-32a^2-70d-68ad-36d^2)g^4z+2g^6z+(102-304a^2$$
$$+96a^4)z^2+(41-456a-104a^2+288a^3+16a^4)dz^2+(-156a+312a^2+48a^3-65d+144ad^2$$
$$+52a^2d+24d^2+24ad^2+4d^3)d^2z^2+(-101+144a+148a^2-8a^3)g^2z^2+(60+288a+141d+$$
$$22ad+14d^2)dg^2z^2+(19-26a-24d)g^4z^2+(129-200a^2+16a^4)z^3+(44-300a-48a^2+48$$
$$a^3-125d-72ad+52a^2d-30d^2+24ad^2+4d^3)dz^3+(-93+56a+36a^2+26d+68ad+33d^2$$
$$g^2z^3+6g^4z^3+(96-64a^2+26d-96ad-8a^2d-40d^2-12ad^2-5d^3-41g^2+10ag^2+4dg^2)$$
$$z^4+(42-8a^2+8d-12ad-5d^2-7g^2)z^5+(10+d)z^6+z^7\}\frac{1}{DT}$$

$$M_{4,6}=\{(8+16a-32a^2-64a^3)g+(20-24a-144a^2-32a^3-96ad-64a^2d-20d^2-40ad^2-8d^3)dg+(-14-20a+24a^2+16a^3-30d+24ad+40a^2d+32ad^2+8d^3)g^3+(14+4a+10d)g^5+(36+56a-80a^2-96a^3)gz+(72-56a-224a^2-32a^3+4d-152ad-64a^2d-32d^2-40ad^2-8d^3)dgz+(-50-36a+40a^2+16a^3)g^3z+(-65+40a+36a^2+d+26ad+6d^2)dg^2z+(25+10a+12d)g^5z+(66+76a-72a^2-48a^3)gz^2+(101-46a-116a^2-8a^3+8d-80ad-16a^2d-17d^2-10ad^2-2d^3)dgz^2+(-64-24a+16a^2-48d+16ad+d^2)g^3z^2+10g^5z^2+(63+50a-28a^2-8a^3+69d-16ad-20a^2d+5d^2-14ad^2-3d^3)gz^3-(35+6a+12d)g^3z^3+(33+16a-4a^2+23d-2ad+d^2-7g^2)gz^4+(9+2a+3d)gz^5+gz^6\}\frac{1}{DT}$$

$$M_{4,7}=\{(4-8a-16a^2+32a^3)g^2+(-2-36a+72a^2+16a^3-18d+48ad+40a^2d+8d^2+32ad^2+8d^3)dg^2-(4+8a+10d+4ad+4d^2)g^4+(6+12a+12d)g^6+(16-24a-32a^2+32a^3)g^2z+(5-74a+68a^2+8a^3-37d+40ad+20a^2d+4d^2+16ad^2+4d^3)dg^2z+(-7-12a+4a^2-14d+4ad)g^4z+2g^6z+(25-26a-20a^2+8a^3-4d-48ad+16a^2d-24d^2+8ad^2)g^2z^2-(3+6a+6d)g^4z^2+(19-12a-4a^2-d-10ad-5d^2)g^2z^3+(7-2a)g^2z^4+g^2z^5\}\frac{1}{DT}$$

$$M_{4,8}=\{(4+24a+48a^2+32a^3)g^2+(22+92a+104a^2+16a^3+42d+104ad+40a^2d+32d^2+32ad^2+8d^3)dg^2+(-8-24a-16a^2-26d-36ad-20d^2)g^4+(6+12a+12d)g^6+(12+56a+80a^2+32a^3)g^2z+(53+158a+108a^2+8a^3+75d+112ad+20a^2d+36d^2+16ad^2+4d^3)dg^2z-(21+40a+12a^2+42d+24ad+12d^2)g^4z+2g^6z+(13+46a+44a^2+8a^3+45d+88ad+28a^2d+43d^2+30ad^2+10d^3)g^2z^2-16(1+a+d)g^4z^2+(6+16a+8a^2+16d+16ad+8d^2)g^2z^3-4g^4z^3+(1+2a+2d)g^2z^4\}\frac{1}{DT}$$

$$M_{8,1}=\{(24+48a-96a^2-192a^3)g+(24-192a-480a^2-102d-396ad+24a^2d+48a^3d-102d^2+48ad^2+120a^2d^2+24d^3+96ad^3+24d^4)dg+(-36-72a+48a^2+96a^3-60d+96ad+240a^2d+54d^2+204ad^2+60d^3)g^3+12(1+2a+2d)g^5+(104+160a-224a^2-256a^3)gz+(82-444a-648a^2-16a^3-241d-554ad-12a^2d+8a^3d-149d^2+24ad^2+20a^2d^2+20d^3+16ad^3+4d^4)dgz+(-122-124a+72a^2+48a^3-91d+120ad+108a^2d+56d^2+76ad^2+16d^3)g^3z+(32+16a+16d)g^5z+(180+200a-176a^2-96a^3+106d-344ad-248a^2d-193d^2-224ad^2+4a^2d^2-64d^3+8ad^3+4d^4)gz^2+(-143-76a+20a^2-47d+34ad+16d^2)g^3z^2+16g^5z^2+(157+114a-52a^2-8a^3+63d-100ad-20a^2d-59d^2-18ad^2-5d^3)gz^3-(67+18a+10d)g^3z^3+(71+28a-4a^2+16d-8ad-5d^2-10g^2)gz^4+(15+2a+d)gz^5+gz^6\}\frac{1}{DT}$$

$$M_{8,2}=\{(8+16a-32a^2-64a^3)g+(4-72a-144a^2+32a^3-40d-104ad+96a^2d+32a^3d-20)d^2g+96ad^2+80a^2d^2+32d^3+64ad^3+16d^4)dg+(-20-40a+48a^2+96a^3-22d+96ad+216a^2d+50d^2+148ad^2+28d^3)g^3+(8+16a+10d)g^5+(40+64a-96a^2-128a^3)gz+(18-212a--296a^2+16a^3-120d-228ad+64a^2d+16a^3d-50d^2+80ad^2+40a^2d^2+32d^3+32ad^3+8d^4)dgz-(72+84a-80a^2-48a^3+37d-148ad-108a^2d-71d^2-74ad^2-14d^3)g^3z+(23+2a-4d)g^5z+(82+100a-104a^2-80a^3+32d-224ad-192a^2d-130d^2-160ad^2+8a^2d^2-40d^3+16ad^3+8d^4)gz^2+(-95-56a+28a^2-17d+50ad+23d^2)g^3z^2+14g^5z^2+(88+76a-48a^2-16a^3+28d-100ad-40a^2d-60d^2-36ad^2-10d^3)gz^3-(54+12a+2d)g^3z^3+(52+28a-8a^2+12d-16ad-10d^2-11g^2)gz^4+(16+4a+2d)gz^5+2gz^6\}\frac{1}{DT}$$

$$M_{8,3}=\{-16(1+a-4a^2-4a^3)g^2+(2+132a+120a^2-16a^3+66d+48ad-40a^2d-8d^2-32ad^2-8d^3)dg^2+(32-32a^2-10d-60ad-28d^2)g^4-12g^6+(-56-40a+96a^2+32a^3+5d+198ad+60a^2d+8a^3d+99d^2+24ad^2+20a^2d^2-4d^3+16ad^3+4d^4)g^2z+(61+4a+4a^2-8d+8ad+4d^2)g^4z-8g^6z+(-71-30a+28a^2-8a^3+4d+56ad-16a^2d+28d^2-8ad^2)g^2z^2+(31+2a)g^4z^2-(37+4a+4a^2-d+10ad+5d^2)g^2z^3+2g^4z^3+(-5+2a)g^2z^4+g^2z^5\}\frac{1}{DT}$$

$$M_{8,4} = \{16+(32-64a-128a^2)a+(24-112a-352a^2-64a^3)d-(56+320a+160a^2)d^2-(96+128a)d^3-32d^4-(24+32a-32a^2)g^2+(-34+68a+8a^2-16a^3)dg^2+(38+24a-40a^2+16d-32ad-8d^2)d^2g^2+(32-32a^2+2d-60ad-28d^2)g^4-12g^6+(72+112a-160a^2-192a^3)z+(88-272a-544a^2-64a^3-136d-512ad-160a^2d-160d^2-128ad^2-32d^3)dz+(-92-72a+48a^2+32a^3-75d+94ad+76a^2d+8a^3d+5d^2+64ad^2+20a^2d^2+20d^3+16ad^3+4d^4)g^2z+(63+32a+4a^2+34d+8ad+4d^2)g^4z-8g^6z+(132+152a-144a^2-96a^3)z^2+(126-236a-280a^2-16a^3-118d-272ad-40a^2d-88d^2-32ad^2-8d^3)dz^2+(-129-74a+20a^2+8a^3-73d+32ad+20a^2d+17d^2+18ad^2+6d^3)g^2z^2+(38+12a+12d)g^4z^2+(126+100a-56a^2-16a^3+88d-88ad-48a^2d-44d^2-48ad^2-16d^3)z^3-(82+36a+34d+4ad+2d^2+8g^2)g^2z^3+(66+32a-8a^2+30d-12ad-6d^2-23g^2-6ag^2-6dg^2)z^4+(18+4a+4d-2g^2)z^5+2z^6\}\frac{1}{DT}$$

$$M_{8,6} = \{(8+32a+32a^2+28d+64ad+16a^2d+28d^2+24ad^2+8d^3)dg+(8+32a+32a^2+18d+40ad+8a^2d+2d^2+4ad^2-4d^3)g^3-(4+8a+2d)g^5+(-8-32a-32a^2)gz+(16a+32a^2+44d+80ad+16a^2d+40d^2+24ad^2+8d^3)dgz+(32+80a+32a^2)g^3z+(49+40a-4a^2+d-10ad-6d^2)dg^3z-(21+14a+12d)g^5z-(28+80a+48a^2)gz^2+(-34-32a+8a^2+19d+32ad+4a^2d+19d^2+6ad^2+2d^3)dgz^2+(49+64a+12a^2+42d+12ad-d^2)g^3z^2-10g^5z^2-(38+72a+24a^2+42d+28ad-4ad^2-3d^3)gz^3+(31+18a+12d)g^3z^3-(25+28a+4a^2+19d+6a+d^2)gz^4+7g^3z^4-(8+4a+3d)gz^5-gz^6\}\frac{1}{DT}$$

$$M_{8,7} = \{(-8+32a^2+4d+64ad-16a^2d+36d^2-32ad^2-16a^2d^2-16d^3-32ad^3-16d^4)g^2+(28-16a-48a^2-20d-80ad-32d^2)g^4-12g^6+(-32+64a^2+10d+128ad-8a^2d+74d^2-16ad^2-8a^2d^2-8d^3-16ad^3-8d^4)g^2z+(60-12a-24a^2-16d-44ad-20d^2)g^4z-8g^6z+(-50+40a^2+8d+80ad+48d^2+40g^2)g^2z^2+(-38+8a^2+2d+16ad+10d^2+8g^2)g^2z^3-14g^2z^4-2g^2z^5\}\frac{1}{DT}$$

$$M_{8,8} = \{16 + 32a - 64a^2 - 128a^3 + (16 - 128a - 320a^2)d - (68 + 264a - 16a^2 - 32a^3)d^2 + (-68 + 32a + 80a^2)d^3 + 16(1 + 4a)d^4 + 16d^5 - (32 + 48a - 64a^2 - 64a^3)g^2 + (-36 + 128a + 144a^2)dg^2 + (72 + 104a - 16a^2)d^2g^2 + (24 - 32a - 16d)d^3g^2 + (36 - 48a^2 - 4d - 80ad - 32d^2)g^4 - 12g^6 + (80 + 128a - 192a^2 - 256a^3)z + (64 - 384a - 640a^2 - 208d - 536ad + 32a^2d + 32a^3d - 140d^2 + 64ad^2 + 80a^2d^2 + 32d^3 + 64ad^3 + 16d^4)dz - (132 + 120a + 144a^2 + 96a^3)g^2z + (-78 + 272a + 216a^2 + 146d + 152ad - 8a^2d + 32d^2 - 16ad^2 - 8d^3)dg^2z + (88 + 12a - 24a^2 + 6d - 44ad - 20d^2 - 8g^2)g^4z + (168 + 208a - 224a^2 - 192a^3)z^2 + (104 - 448a - 480a^2 - 249d^2 - 410ad + 20a^2d + 8a^3d - 109d^2 + 40ad^2 + 20a^2d^2 + 20d^3 + 16ad^3 + 4d^4)dz^2 + (-210 - 120a + 104a^2 + 32a^3)g^2z^3 + (-66 + 192a + 72a^2)dg^2z^2 + (101 + 50a + 10d)d^2g^2z^2 + (69 + 6a + 4d)g^4z^2 + (192 + 176a - 128a^2 - 64a^3)z^3 + (88 - 256a - 160a^2)dz^3 - (147 + 140a - 4a^2 + 38d - 8ad - 4d^2)d^2z^3 - (162 + 56a - 24a^2 + 26d - 44ad - 23d^2 - 18g^2)g^2z^3 + (129 + 82a - 36a^2 - 8a^3)z^4 + (41 - 72a - 20a^2 - 43d - 18ad - 5d^2)dz^4 - (61 + 10a + 4d)g^2z^4 + (51 + 20a - 4a^2 + 10d - 8ad - 5d^2 - 9g^2)z^5 + (11 + 2a + d)z^6 + z^7\} \frac{1}{DT}$$

DT is the determinant of the matrix.

$$DT = 16 - (128 + 256a^2)a^4 - (192a - 768a^3 - 84d + 864a^2 - 64a^4)d + (432a - 192a^3 + 84d - 208a^2d - 96ad^2 - 16d^3)d^3 - (40 - 192a^2 + 128a^4)g^2 + (-16 + 288a - 64a^2 - 384a^3)dg^2 + (120 - 128a - 480a^2 - 56d - 304ad - 80d^2)d^2g^2 + (48 - 64a - 128a^2)g^4 - (36 + 208a + 16a^2)dg^4 - (80 + 8a - 8d)d^2g^4 + (-16 + 16a + 4d)g^6 + (96 - 512a^2 + 512a^4)z + (-768a + 1536a^3 - 340d + 1760a^2d - 64a^4d)dz + (912a - 192a^3 + 188d - 208a^2d - 96ad^2 - 16d^3)d^3z + (-196 + 64a + 576a^2 - 192a^4 + 872ad - 64a^2d - 544a^3d)g^2z + (372 - 160a - 624a^2 - 80d - 368ad - 96d^2)d^2g^2z + (164 - 160a - 208a^2 - 98d - 336ad + 8a^2d)g^4z + (-130 + 20a + 12d)d^2g^4z + (-22 + 28a + 24d)g^6z + (248 - 832a^2 + 384a^4 - 1248ad + 1152a^3d)z^2 + (-561 + 1352 - 16a^4 + 732ad - 48a^3d)d^2z^2 + (161 - 52a^2 - 24ad - 4d^2)d^4z^2 + (-396 + 160a + 640a^2 - 64a^4)g^2z^2 + (68 + 972a - 16a^2 - 176a^3 + 424d - 64ad - 192a^2d - 38d^2 - 28d^3)dg^2z^2 + (203 - 128a - 76a^2)g^4z^2 - (84 + 120a + 46d +)dg^4z^2 - 12g^6z^2 + (360 - 704a^2 + 128a^4 - 1056ad + 384a^3d)z^3 + (-484 + 464a^2 + 264ad + 62d^2)d^2z^3 + (-422 + 144a + 312a^2 + 84d + 472ad)g^2z^3 + (210 - 8a - 6d)d^2g^2z^3 + (110 - 36a - 24d)g^4z^3 + (321 - 328a^2 + 16a^4 - 492ad + 48a^3d)z^4 + (-231 + 60a^2 + 36ad + 9d^2)d^2z^4 + (-250 + 56a + 56a^2 + 38d + 84ad + 38d^2 + 22g^2)g^2z^4 + (180 - 80a^2 - 120ad - 58d^2)z^5 + (-78 + 8a + 6d)g^2z^5 + (62 - 8a^2 - 12ad - 6d^2 - 10g^2)z^6 + 12z^7 + z^8$$