Model for “UPt2Si2”

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General Condition

- Basis type: `lg`
- SAMB selection:
  - Type: `[Q, G]`
  - Rank: `[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]`
  - Irrep.: $[A_{1g}, A_{2g}, B_{1g}, B_{2g}, E_g, A_{1u}, A_{2u}, B_{1u}, B_{2u}, E_u]$
  - Spin (s): `[0, 1]`
- Atomic selection:
  - Type: `[Q, G, M, T]`
  - Rank: `[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]`
  - Irrep.: $[A_{1g}, A_{2g}, B_{1g}, B_{2g}, E_g, A_{1u}, A_{2u}, B_{1u}, B_{2u}, E_u]$
  - Spin (s): `[0, 1]`
- Site-cluster selection:
  - Rank: `[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]`
  - Irrep.: $[A_{1g}, A_{2g}, B_{1g}, B_{2g}, E_g, A_{1u}, A_{2u}, B_{1u}, B_{2u}, E_u]$
- Bond-cluster selection:
  - Type: `[Q, G, M, T]`
  - Rank: `[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]`
  - Irrep.: $[A_{1g}, A_{2g}, B_{1g}, B_{2g}, E_g, A_{1u}, A_{2u}, B_{1u}, B_{2u}, E_u]$
- Max. neighbor: `10`
- Search cell range: `(-2, 3), (-2, 3), (-2, 3)`
- Toroidal priority: `false`

Group and Unit Cell

- Group: SG No. 129 D_{4h}^{7} $P4/nmm$ [tetragonal]
- Associated point group: PG No. 129 D_{4h} $4/mmm$ [tetragonal]
- Unit cell:
  $a =$ 4.19720, $b =$ 4.19720, $c =$ 9.69060, $\alpha = 90.0$, $\beta = 90.0$, $\gamma = 90.0$
- Lattice vectors (conventional cell):
  $\boldsymbol{a}_1 =$ [4.19720, 0.00000, 0.00000]
  $\boldsymbol{a}_2 =$ [0.00000, 4.19720, 0.00000]
  $\boldsymbol{a}_3 =$ [0.00000, 0.00000, 9.69060]

Symmetry Operation

Table 1: Symmetry operation

#	SO	#	SO	#	SO	#	SO	#	SO
1	$\{1\|0\}$	2	$\{2_{001}\|\frac{1}{2}\frac{1}{2}0\}$	3	$\{4^{+}_{001}\|\frac{1}{2}00\}$	4	$\{4^{-}_{001}\|0\frac{1}{2}0\}$	5	$\{2_{010}\|0\frac{1}{2}0\}$
6	$\{2_{100}\|\frac{1}{2}00\}$	7	$\{2_{110}\|\frac{1}{2}\frac{1}{2}0\}$	8	$\{2_{1-10}\|0\}$	9	$\{-1\|0\}$	10	$\{\mathrm{m}_{001}\|\frac{1}{2}\frac{1}{2}0\}$
11	$\{-4^{+}_{001}\|\frac{1}{2}00\}$	12	$\{-4^{-}_{001}\|0\frac{1}{2}0\}$	13	$\{\mathrm{m}_{010}\|0\frac{1}{2}0\}$	14	$\{\mathrm{m}_{100}\|\frac{1}{2}00\}$	15	$\{\mathrm{m}_{110}\|\frac{1}{2}\frac{1}{2}0\}$
16	$\{\mathrm{m}_{1-10}\|0\}$								

Harmonics

Table 2: Harmonics

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
1	$\mathbb{Q}_0(A_{1g})$	A_{1g}	0	Q, T	-	-	1
2	$\mathbb{Q}_2(A_{1g})$	A_{1g}	2	Q, T	-	-	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
3	$\mathbb{Q}_4(A_{1g},1)$	A_{1g}	4	Q, T	1	-	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
4	$\mathbb{Q}_4(A_{1g},2)$	A_{1g}	4	Q, T	2	-	$-\frac{\sqrt{15}\left(x^4-12x^2y^2+6x^2z^2+y^4+6y^2z^2-2z^4\right)}{12}$
5	$\mathbb{G}_5(A_{1g})$	A_{1g}	5	G, M	-	-	$\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$
6	$\mathbb{Q}_6(A_{1g},1)$	A_{1g}	6	Q, T	1	-	$\frac{\sqrt{2}\left(2x^6-15x^4y^2-15x^4z^2-15x^2y^4+180x^2y^2z^2-15x^2z^4+2y^6-15y^4z^2-15y^2z^4+2z^6\right)}{8}$
7	$\mathbb{Q}_6(A_{1g},2)$	A_{1g}	6	Q, T	2	-	$-\frac{\sqrt{14}\left(x^6-15x^4z^2+15x^2z^4+y^6-15y^4z^2+15y^2z^4-2z^6\right)}{8}$

continued ...

Table 2

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
8	$\mathbb{G}_0(A_{1u})$	A_{1u}	0	G, M	-	-	1
9	$\mathbb{G}_2(A_{1u})$	A_{1u}	2	G, M	-	-	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
10	$\mathbb{G}_4(A_{1u},1)$	A_{1u}	4	G, M	1	-	$\frac{\sqrt{21}\left(x^4-3x^2y^2-3x^2z^2+y^4-3y^2z^2+z^4\right)}{6}$
11	$\mathbb{Q}_5(A_{1u})$	A_{1u}	5	Q, T	-	-	$\frac{3\sqrt{35}xyz(x-y)(x+y)}{2}$
12	$\mathbb{G}_1(A_{2g})$	A_{2g}	1	G, M	-	-	z
13	$\mathbb{G}_3(A_{2g})$	A_{2g}	3	G, M	-	-	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
14	$\mathbb{Q}_4(A_{2g})$	A_{2g}	4	Q, T	-	-	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
15	$\mathbb{G}_5(A_{2g},1)$	A_{2g}	5	G, M	1	-	$\frac{z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{8}$
16	$\mathbb{G}_5(A_{2g},2)$	A_{2g}	5	G, M	2	-	$\frac{3\sqrt{35}z\left(x^2-2xy-y^2\right)\left(x^2+2xy-y^2\right)}{8}$
17	$\mathbb{Q}_6(A_{2g})$	A_{2g}	6	Q, T	-	-	$-\frac{3\sqrt{7}xy(x-y)(x+y)\left(x^2+y^2-10z^2\right)}{4}$
18	$\mathbb{Q}_1(A_{2u})$	A_{2u}	1	Q, T	-	-	z
19	$\mathbb{Q}_3(A_{2u})$	A_{2u}	3	Q, T	-	-	$-\frac{z\left(3x^2+3y^2-2z^2\right)}{2}$
20	$\mathbb{Q}_5(A_{2u},1)$	A_{2u}	5	Q, T	1	-	$\frac{z\left(15x^4+30x^2y^2-40x^2z^2+15y^4-40y^2z^2+8z^4\right)}{8}$
21	$\mathbb{Q}_5(A_{2u},2)$	A_{2u}	5	Q, T	2	-	$\frac{3\sqrt{35}z\left(x^2-2xy-y^2\right)\left(x^2+2xy-y^2\right)}{8}$
22	$\mathbb{Q}_2(B_{1g})$	B_{1g}	2	Q, T	-	-	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
23	$\mathbb{G}_3(B_{1g})$	B_{1g}	3	G, M	-	-	$\sqrt{15}xyz$
24	$\mathbb{Q}_4(B_{1g})$	B_{1g}	4	Q, T	-	-	$\frac{\sqrt{5}(x-y)(x+y)\left(x^2+y^2-6z^2\right)}{4}$
25	$\mathbb{G}_5(B_{1g})$	B_{1g}	5	G, M	-	-	$\frac{\sqrt{105}xyz\left(x^2+y^2-2z^2\right)}{2}$
26	$\mathbb{Q}_6(B_{1g},1)$	B_{1g}	6	Q, T	1	-	$-\frac{\sqrt{2310}(x-y)(x+y)(x-z)(x+z)(y-z)(y+z)}{8}$
27	$\mathbb{Q}_6(B_{1g},2)$	B_{1g}	6	Q, T	2	-	$\frac{\sqrt{42}(x-y)(x+y)\left(x^4-9x^2y^2-5x^2z^2+y^4-5y^2z^2+5z^4\right)}{8}$
28	$\mathbb{G}_2(B_{1u})$	B_{1u}	2	G, M	-	-	$\frac{\sqrt{3}(x-y)(x+y)}{2}$

continued ...

Table 2

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
29	$\mathbb{Q}_3(B_{1u})$	B_{1u}	3	Q, T	-	-	$\sqrt{15}xyz$
30	$\mathbb{Q}_5(B_{1u})$	B_{1u}	5	Q, T	-	-	$\frac{\sqrt{105}xyz\left(x^2+y^2-2z^2\right)}{2}$
31	$\mathbb{Q}_7(B_{1u},1)$	B_{1u}	7	Q, T	1	-	$\frac{\sqrt{91}xyz\left(3x^4-5x^2y^2-5x^2z^2+3y^4-5y^2z^2+3z^4\right)}{2}$
32	$\mathbb{Q}_2(B_{2g})$	B_{2g}	2	Q, T	-	-	$\sqrt{3}xy$
33	$\mathbb{G}_3(B_{2g})$	B_{2g}	3	G, M	-	-	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
34	$\mathbb{Q}_4(B_{2g})$	B_{2g}	4	Q, T	-	-	$-\frac{\sqrt{5}xy\left(x^2+y^2-6z^2\right)}{2}$
35	$\mathbb{G}_5(B_{2g})$	B_{2g}	5	G, M	-	-	$-\frac{\sqrt{105}z(x-y)(x+y)\left(x^2+y^2-2z^2\right)}{4}$
36	$\mathbb{Q}_6(B_{2g},1)$	B_{2g}	6	Q, T	1	-	$\frac{\sqrt{462}xy\left(x^2-3y^2\right)\left(3x^2-y^2\right)}{16}$
37	$\mathbb{Q}_6(B_{2g},2)$	B_{2g}	6	Q, T	2	-	$\frac{\sqrt{210}xy\left(x^4+2x^2y^2-16x^2z^2+y^4-16y^2z^2+16z^4\right)}{16}$
38	$\mathbb{G}_2(B_{2u})$	B_{2u}	2	G, M	-	-	$\sqrt{3}xy$
39	$\mathbb{Q}_3(B_{2u})$	B_{2u}	3	Q, T	-	-	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
40	$\mathbb{Q}_5(B_{2u})$	B_{2u}	5	Q, T	-	-	$-\frac{\sqrt{105}z(x-y)(x+y)\left(x^2+y^2-2z^2\right)}{4}$
41	$\mathbb{Q}_7(B_{2u},1)$	B_{2u}	7	Q, T	1	-	$\frac{\sqrt{6006}z(x-y)(x+y)\left(x^2-4xy+y^2\right)\left(x^2+4xy+y^2\right)}{32}$
42	$\mathbb{G}_{1,1}(E_g)$	E_g	1	G, M	-	1	x
43	$\mathbb{G}_{1,2}(E_g)$					2	$-y$
44	$\mathbb{Q}_{2,1}(E_g)$	E_g	2	Q, T	-	1	$\sqrt{3}yz$
45	$\mathbb{Q}_{2,2}(E_g)$					2	$\sqrt{3}xz$
46	$\mathbb{G}_{3,1}(E_g,1)$	E_g	3	G, M	1	1	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$
47	$\mathbb{G}_{3,2}(E_g,1)$					2	$\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
48	$\mathbb{G}_{3,1}(E_g,2)$	E_g	3	G, M	2	1	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
49	$\mathbb{G}_{3,2}(E_g,2)$					2	$-\frac{\sqrt{15}y(x-z)(x+z)}{2}$

continued ...

Table 2

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
50	$\mathbb{Q}_{4,1}(E_g,1)$	E_g	4	Q, T	1	1	$\frac{\sqrt{35}yz(y-z)(y+z)}{2}$
51	$\mathbb{Q}_{4,2}(E_g,1)$					2	$\frac{\sqrt{35}xz(x-z)(x+z)}{2}$
52	$\mathbb{Q}_{4,1}(E_g,2)$	E_g	4	Q, T	2	1	$\frac{\sqrt{5}yz\left(6x^2-y^2-z^2\right)}{2}$
53	$\mathbb{Q}_{4,2}(E_g,2)$					2	$-\frac{\sqrt{5}xz\left(x^2-6y^2+z^2\right)}{2}$
54	$\mathbb{G}_{5,1}(E_g,1)$	E_g	5	G, M	1	1	$\frac{x\left(8x^4-40x^2y^2-40x^2z^2+15y^4+30y^2z^2+15z^4\right)}{8}$
55	$\mathbb{G}_{5,2}(E_g,1)$					2	$-\frac{y\left(15x^4-40x^2y^2+30x^2z^2+8y^4-40y^2z^2+15z^4\right)}{8}$
56	$\mathbb{G}_{5,1}(E_g,2)$	E_g	5	G, M	2	1	$\frac{3\sqrt{35}x\left(y^2-2yz-z^2\right)\left(y^2+2yz-z^2\right)}{8}$
57	$\mathbb{G}_{5,2}(E_g,2)$					2	$-\frac{3\sqrt{35}y\left(x^2-2xz-z^2\right)\left(x^2+2xz-z^2\right)}{8}$
58	$\mathbb{G}_{5,1}(E_g,3)$	E_g	5	G, M	3	1	$\frac{\sqrt{105}x(y-z)(y+z)\left(2x^2-y^2-z^2\right)}{4}$
59	$\mathbb{G}_{5,2}(E_g,3)$					2	$\frac{\sqrt{105}y(x-z)(x+z)\left(x^2-2y^2+z^2\right)}{4}$
60	$\mathbb{Q}_{6,1}(E_g,1)$	E_g	6	Q, T	1	1	$\frac{3\sqrt{7}yz(y-z)(y+z)\left(10x^2-y^2-z^2\right)}{4}$
61	$\mathbb{Q}_{6,2}(E_g,1)$					2	$-\frac{3\sqrt{7}xz(x-z)(x+z)\left(x^2-10y^2+z^2\right)}{4}$
62	$\mathbb{Q}_{6,1}(E_g,2)$	E_g	6	Q, T	2	1	$\frac{\sqrt{462}yz\left(y^2-3z^2\right)\left(3y^2-z^2\right)}{16}$
63	$\mathbb{Q}_{6,2}(E_g,2)$					2	$\frac{\sqrt{462}xz\left(x^2-3z^2\right)\left(3x^2-z^2\right)}{16}$
64	$\mathbb{Q}_{6,1}(E_g,3)$	E_g	6	Q, T	3	1	$\frac{\sqrt{210}yz\left(16x^4-16x^2y^2-16x^2z^2+y^4+2y^2z^2+z^4\right)}{16}$
65	$\mathbb{Q}_{6,2}(E_g,3)$					2	$\frac{\sqrt{210}xz\left(x^4-16x^2y^2+2x^2z^2+16y^4-16y^2z^2+z^4\right)}{16}$
66	$\mathbb{Q}_{1,1}(E_u)$	E_u	1	Q, T	-	1	x
67	$\mathbb{Q}_{1,2}(E_u)$					2	y
68	$\mathbb{G}_{2,1}(E_u)$	E_u	2	G, M	-	1	$\sqrt{3}yz$
69	$\mathbb{G}_{2,2}(E_u)$					2	$-\sqrt{3}xz$
70	$\mathbb{Q}_{3,1}(E_u,1)$	E_u	3	Q, T	1	1	$\frac{x\left(2x^2-3y^2-3z^2\right)}{2}$

continued ...

Table 2

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
71	$\mathbb{Q}_{3,2}(E_u,1)$					2	$-\frac{y\left(3x^2-2y^2+3z^2\right)}{2}$
72	$\mathbb{Q}_{3,1}(E_u,2)$	E_u	3	Q, T	2	1	$\frac{\sqrt{15}x(y-z)(y+z)}{2}$
73	$\mathbb{Q}_{3,2}(E_u,2)$					2	$\frac{\sqrt{15}y(x-z)(x+z)}{2}$
74	$\mathbb{Q}_{5,1}(E_u,1)$	E_u	5	Q, T	1	1	$\frac{x\left(8x^4-40x^2y^2-40x^2z^2+15y^4+30y^2z^2+15z^4\right)}{8}$
75	$\mathbb{Q}_{5,2}(E_u,1)$					2	$\frac{y\left(15x^4-40x^2y^2+30x^2z^2+8y^4-40y^2z^2+15z^4\right)}{8}$
76	$\mathbb{Q}_{5,1}(E_u,2)$	E_u	5	Q, T	2	1	$\frac{3\sqrt{35}x\left(y^2-2yz-z^2\right)\left(y^2+2yz-z^2\right)}{8}$
77	$\mathbb{Q}_{5,2}(E_u,2)$					2	$\frac{3\sqrt{35}y\left(x^2-2xz-z^2\right)\left(x^2+2xz-z^2\right)}{8}$
78	$\mathbb{Q}_{5,1}(E_u,3)$	E_u	5	Q, T	3	1	$\frac{\sqrt{105}x(y-z)(y+z)\left(2x^2-y^2-z^2\right)}{4}$
79	$\mathbb{Q}_{5,2}(E_u,3)$					2	$-\frac{\sqrt{105}y(x-z)(x+z)\left(x^2-2y^2+z^2\right)}{4}$

Basis in full matrix

Table 3: dimension = 46

#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)
0	$\lvert d_v\rangle$ @Pt1(1)	1	$\lvert d_{xy}\rangle$ @Pt1(1)	2	$\lvert d_{xz}\rangle$ @Pt1(1)	3	$\lvert d_{yz}\rangle$ @Pt1(1)	4	$\lvert d_u\rangle$ @Pt1(1)
5	$\lvert d_v\rangle$ @Pt1(2)	6	$\lvert d_{xy}\rangle$ @Pt1(2)	7	$\lvert d_{xz}\rangle$ @Pt1(2)	8	$\lvert d_{yz}\rangle$ @Pt1(2)	9	$\lvert d_u\rangle$ @Pt1(2)
10	$\lvert d_v\rangle$ @Pt2(1)	11	$\lvert d_{xy}\rangle$ @Pt2(1)	12	$\lvert d_{xz}\rangle$ @Pt2(1)	13	$\lvert d_{yz}\rangle$ @Pt2(1)	14	$\lvert d_u\rangle$ @Pt2(1)
15	$\lvert d_v\rangle$ @Pt2(2)	16	$\lvert d_{xy}\rangle$ @Pt2(2)	17	$\lvert d_{xz}\rangle$ @Pt2(2)	18	$\lvert d_{yz}\rangle$ @Pt2(2)	19	$\lvert d_u\rangle$ @Pt2(2)
20	$\lvert p_x\rangle$ @Si1(1)	21	$\lvert p_y\rangle$ @Si1(1)	22	$\lvert p_z\rangle$ @Si1(1)	23	$\lvert p_x\rangle$ @Si1(2)	24	$\lvert p_y\rangle$ @Si1(2)

continued ...

Table 3

#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)
25	$\|p_z\rangle$ @Si1(2)	26	$\|p_x\rangle$ @Si2(1)	27	$\|p_y\rangle$ @Si2(1)	28	$\|p_z\rangle$ @Si2(1)	29	$\|p_x\rangle$ @Si2(2)
30	$\|p_y\rangle$ @Si2(2)	31	$\|p_z\rangle$ @Si2(2)	32	$\|f_2\rangle$ @U(1)	33	$\|f_1\rangle$ @U(1)	34	$\|f_{bz}\rangle$ @U(1)
35	$\|f_3\rangle$ @U(1)	36	$\|f_{3x}\rangle$ @U(1)	37	$\|f_{3y}\rangle$ @U(1)	38	$\|f_{az}\rangle$ @U(1)	39	$\|f_2\rangle$ @U(2)
40	$\|f_1\rangle$ @U(2)	41	$\|f_{bz}\rangle$ @U(2)	42	$\|f_3\rangle$ @U(2)	43	$\|f_{3x}\rangle$ @U(2)	44	$\|f_{3y}\rangle$ @U(2)
45	$\|f_{az}\rangle$ @U(2)								

Table 4: Atomic basis (orbital part only)

orbital	definition
$\|p_x\rangle$	x
$\|p_y\rangle$	y
$\|p_z\rangle$	z
$\|d_v\rangle$	$\frac{\sqrt{3}(x^2-y^2)}{2}$
$\|d_{xy}\rangle$	$\sqrt{3}xy$
$\|d_{xz}\rangle$	$\sqrt{3}xz$
$\|d_{yz}\rangle$	$\sqrt{3}yz$
$\|d_u\rangle$	$-\frac{x^2}{2}-\frac{y^2}{2}+z^2$
$\|f_2\rangle$	$\frac{\sqrt{10}x(x^2-3y^2)}{4}$
$\|f_1\rangle$	$\frac{\sqrt{10}y(3x^2-y^2)}{4}$
$\|f_{bz}\rangle$	$\frac{\sqrt{15}z(x^2-y^2)}{2}$

continued ...

Table 4

orbital	definition
$\|f_3\rangle$	$\sqrt{15}xyz$
$\|f_{3x}\rangle$	$\frac{\sqrt{6}x(-x^2-y^2+4z^2)}{4}$
$\|f_{3y}\rangle$	$\frac{\sqrt{6}y(-x^2-y^2+4z^2)}{4}$
$\|f_{az}\rangle$	$\frac{z(-3x^2-3y^2+2z^2)}{2}$

SAMB: 380 (all 380)

- `Pt1` : '`Pt1`' site-cluster
  - * bra: $\langle d_v|$, $\langle d_{xy}|$, $\langle d_{xz}|$, $\langle d_{yz}|$, $\langle d_u|$
  - * ket: $|d_v\rangle$, $|d_{xy}\rangle$, $|d_{xz}\rangle$, $|d_{yz}\rangle$, $|d_u\rangle$
  - * wyckoff: `2a`

$\boxed{\text{z1}}$ $\mathbb{Q}_0^{(c)}(A_{1g}) = \mathbb{Q}_0^{(a)}(A_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z2}}$ $\mathbb{Q}_2^{(c)}(A_{1g}) = \mathbb{Q}_2^{(a)}(A_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z3}}$ $\mathbb{Q}_4^{(c)}(A_{1g}, 1) = \mathbb{Q}_4^{(a)}(A_{1g}, 1)\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z4}}$ $\mathbb{Q}_4^{(c)}(A_{1g}, 2) = \mathbb{Q}_4^{(a)}(A_{1g}, 2)\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z35}}$ $\mathbb{Q}_5^{(c)}(A_{1u}, a) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z53}}$ $\mathbb{Q}_5^{(c)}(A_{1u}, b) = \mathbb{Q}_4^{(a)}(B_{2g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z54}}$ $\mathbb{Q}_4^{(c)}(A_{2g}) = \mathbb{Q}_4^{(a)}(A_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z79}}$ $\mathbb{Q}_1^{(c)}(A_{2u}, a) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z80}}$ $\mathbb{Q}_1^{(c)}(A_{2u}, b) = -\mathbb{Q}_4^{(a)}(B_{1g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z103}}$ $\mathbb{Q}_2^{(c)}(B_{1g}) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z104}}$ $\mathbb{Q}_4^{(c)}(B_{1g}) = \mathbb{Q}_4^{(a)}(B_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z105}}$ $\mathbb{Q}_3^{(c)}(B_{1u}) = \mathbb{Q}_4^{(a)}(A_{2g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z106}}$ $\mathbb{Q}_2^{(c)}(B_{2g}) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z107}}$ $\mathbb{Q}_4^{(c)}(B_{2g}) = \mathbb{Q}_4^{(a)}(B_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z108}}$ $\mathbb{Q}_3^{(c)}(B_{2u}, a) = \mathbb{Q}_0^{(a)}(A_{1g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z191}}$ $\mathbb{Q}_3^{(c)}(B_{2u}, b) = -\frac{\mathbb{Q}_4^{(a)}(A_{1g}, 1)\mathbb{Q}_3^{(s)}(B_{2u})}{6} - \frac{\sqrt{35}\mathbb{Q}_4^{(a)}(A_{1g}, 2)\mathbb{Q}_3^{(s)}(B_{2u})}{6}$

$\boxed{\text{z192}}$ $\mathbb{Q}_5^{(c)}(B_{2u}, a) = \mathbb{Q}_2^{(a)}(A_{1g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z211}}$ $\mathbb{Q}_5^{(c)}(B_{2u}, b) = -\frac{\sqrt{35}\mathbb{Q}_4^{(a)}(A_{1g}, 1)\mathbb{Q}_3^{(s)}(B_{2u})}{6} + \frac{\mathbb{Q}_4^{(a)}(A_{1g}, 2)\mathbb{Q}_3^{(s)}(B_{2u})}{6}$

$\boxed{\text{z212}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$

$\boxed{\text{z242}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$

$\boxed{\text{z264}}$ $\mathbb{Q}_{4,1}^{(c)}(E_g, 1) = \frac{\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_g, 1)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$

$\boxed{\text{z265}}$ $\mathbb{Q}_{4,2}^{(c)}(E_g, 1) = \frac{\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_g, 1)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$

$\boxed{\text{z266}}$ $\mathbb{Q}_{4,1}^{(c)}(E_g, 2) = \frac{\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_g, 2)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$

$\boxed{\text{z267}}$ $\mathbb{Q}_{4,2}^{(c)}(E_g, 2) = \frac{\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_g, 2)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$

$\boxed{\text{z293}}$ $\mathbb{Q}_{1,1}^{(c)}(E_u, a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_{3}^{(s)}(B_{2u})}{2}$

$\boxed{\text{z294}}$ $\mathbb{Q}_{1,2}^{(c)}(E_u, a) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_{3}^{(s)}(B_{2u})}{2}$

$\boxed{\text{z295}}$ $\mathbb{Q}_{1,1}^{(c)}(E_u, b) = \frac{\sqrt{14}\mathbb{Q}_{4,2}^{(a)}(E_g, 1)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8} - \frac{3\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_g, 2)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8}$

$\boxed{\text{z296}}$ $\mathbb{Q}_{1,2}^{(c)}(E_u, b) = -\frac{\sqrt{14}\mathbb{Q}_{4,1}^{(a)}(E_g, 1)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8} + \frac{3\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_g, 2)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8}$

$\boxed{\text{z297}}$ $\mathbb{Q}_{3,1}^{(c)}(E_u, 1) = \frac{3\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_g, 1)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8} + \frac{\sqrt{14}\mathbb{Q}_{4,2}^{(a)}(E_g, 2)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8}$

$\boxed{\text{z298}}$ $\mathbb{Q}_{3,2}^{(c)}(E_u, 1) = -\frac{3\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_g, 1)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8} - \frac{\sqrt{14}\mathbb{Q}_{4,1}^{(a)}(E_g, 2)\mathbb{Q}_{3}^{(s)}(B_{2u})}{8}$

- `Pt2` : '`Pt2`' site-cluster
  * bra: $\langle d_v|$, $\langle d_{xy}|$, $\langle d_{xz}|$, $\langle d_{yz}|$, $\langle d_u|$
  * ket: $|d_v\rangle$, $|d_{xy}\rangle$, $|d_{xz}\rangle$, $|d_{yz}\rangle$, $|d_u\rangle$
  * wyckoff: `2c`

$\boxed{\text{z5}}$ $\mathbb{Q}_{0}^{(c)}(A_{1g}) = \mathbb{Q}_{0}^{(a)}(A_{1g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z6}}$ $\mathbb{Q}_{2}^{(c)}(A_{1g}) = \mathbb{Q}_{2}^{(a)}(A_{1g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z7}}$ $\mathbb{Q}_{4}^{(c)}(A_{1g}, 1) = \mathbb{Q}_{4}^{(a)}(A_{1g}, 1)\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z8}}$ $\mathbb{Q}_{4}^{(c)}(A_{1g}, 2) = \mathbb{Q}_{4}^{(a)}(A_{1g}, 2)\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z36}}$ $\mathbb{Q}_{5}^{(c)}(A_{1u}) = \mathbb{Q}_{4}^{(a)}(A_{2g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z55}}$ $\mathbb{Q}_{4}^{(c)}(A_{2g}) = \mathbb{Q}_{4}^{(a)}(A_{2g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z56}}$ $\mathbb{Q}_{1}^{(c)}(A_{2u}, a) = \mathbb{Q}_{0}^{(a)}(A_{1g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z81}}$ $\mathbb{Q}_{1}^{(c)}(A_{2u}, b) = \mathbb{Q}_{2}^{(a)}(A_{1g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z82}}$ $$\mathbb{Q}_3^{(c)}(A_{2u}) = \frac{\sqrt{21}\mathbb{Q}_4^{(a)}(A_{1g},1)\mathbb{Q}_1^{(s)}(A_{2u})}{6} + \frac{\sqrt{15}\mathbb{Q}_4^{(a)}(A_{1g},2)\mathbb{Q}_1^{(s)}(A_{2u})}{6}$$

$\boxed{\text{z109}}$ $$\mathbb{Q}_5^{(c)}(A_{2u},2) = \frac{\sqrt{15}\mathbb{Q}_4^{(a)}(A_{1g},1)\mathbb{Q}_1^{(s)}(A_{2u})}{6} - \frac{\sqrt{21}\mathbb{Q}_4^{(a)}(A_{1g},2)\mathbb{Q}_1^{(s)}(A_{2u})}{6}$$

$\boxed{\text{z110}}$ $$\mathbb{Q}_2^{(c)}(B_{1g}) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$$

$\boxed{\text{z111}}$ $$\mathbb{Q}_4^{(c)}(B_{1g}) = \mathbb{Q}_4^{(a)}(B_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$$

$\boxed{\text{z112}}$ $$\mathbb{Q}_3^{(c)}(B_{1u},a) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_1^{(s)}(A_{2u})$$

$\boxed{\text{z113}}$ $$\mathbb{Q}_3^{(c)}(B_{1u},b) = \mathbb{Q}_4^{(a)}(B_{2g})\mathbb{Q}_1^{(s)}(A_{2u})$$

$\boxed{\text{z114}}$ $$\mathbb{Q}_2^{(c)}(B_{2g}) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$$

$\boxed{\text{z193}}$ $$\mathbb{Q}_4^{(c)}(B_{2g}) = \mathbb{Q}_4^{(a)}(B_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$$

$\boxed{\text{z213}}$ $$\mathbb{Q}_3^{(c)}(B_{2u},a) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_1^{(s)}(A_{2u})$$

$\boxed{\text{z214}}$ $$\mathbb{Q}_3^{(c)}(B_{2u},b) = -\mathbb{Q}_4^{(a)}(B_{1g})\mathbb{Q}_1^{(s)}(A_{2u})$$

$\boxed{\text{z215}}$ $$\mathbb{Q}_{2,1}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z216}}$ $$\mathbb{Q}_{2,2}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z243}}$ $$\mathbb{Q}_{4,1}^{(c)}(E_g,1) = \frac{\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_g,1)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z244}}$ $$\mathbb{Q}_{4,2}^{(c)}(E_g,1) = \frac{\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_g,1)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z268}}$ $$\mathbb{Q}_{4,1}^{(c)}(E_g,2) = \frac{\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_g,2)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z269}}$ $$\mathbb{Q}_{4,2}^{(c)}(E_g,2) = \frac{\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_g,2)\mathbb{Q}_0^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z299}}$ $\mathbb{Q}_{1,1}^{(c)}(E_u) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_1^{(s)}(A_{2u})}{2}$

$\boxed{\text{z300}}$ $\mathbb{Q}_{1,2}^{(c)}(E_u) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_1^{(s)}(A_{2u})}{2}$

$\boxed{\text{z301}}$ $\mathbb{Q}_{3,1}^{(c)}(E_u, 1) = \frac{\sqrt{7}\mathbb{Q}_{4,2}^{(a)}(E_g, 1)\mathbb{Q}_1^{(s)}(A_{2u})}{4} - \frac{\mathbb{Q}_{4,2}^{(a)}(E_g, 2)\mathbb{Q}_1^{(s)}(A_{2u})}{4}$

$\boxed{\text{z302}}$ $\mathbb{Q}_{3,2}^{(c)}(E_u, 1) = \frac{\sqrt{7}\mathbb{Q}_{4,1}^{(a)}(E_g, 1)\mathbb{Q}_1^{(s)}(A_{2u})}{4} - \frac{\mathbb{Q}_{4,1}^{(a)}(E_g, 2)\mathbb{Q}_1^{(s)}(A_{2u})}{4}$

$\boxed{\text{z303}}$ $\mathbb{Q}_{3,1}^{(c)}(E_u, 2) = \frac{\mathbb{Q}_{4,2}^{(a)}(E_g, 1)\mathbb{Q}_1^{(s)}(A_{2u})}{4} + \frac{\sqrt{7}\mathbb{Q}_{4,2}^{(a)}(E_g, 2)\mathbb{Q}_1^{(s)}(A_{2u})}{4}$

$\boxed{\text{z304}}$ $\mathbb{Q}_{3,2}^{(c)}(E_u, 2) = \frac{\mathbb{Q}_{4,1}^{(a)}(E_g, 1)\mathbb{Q}_1^{(s)}(A_{2u})}{4} + \frac{\sqrt{7}\mathbb{Q}_{4,1}^{(a)}(E_g, 2)\mathbb{Q}_1^{(s)}(A_{2u})}{4}$

- `Si1` : '`Si1`' site-cluster
  * bra: $\langle p_x|$, $\langle p_y|$, $\langle p_z|$
  * ket: $|p_x\rangle$, $|p_y\rangle$, $|p_z\rangle$
  * wyckoff: `2b`

$\boxed{\text{z9}}$ $\mathbb{Q}_0^{(c)}(A_{1g}) = \mathbb{Q}_0^{(a)}(A_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z10}}$ $\mathbb{Q}_2^{(c)}(A_{1g}) = \mathbb{Q}_2^{(a)}(A_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z57}}$ $\mathbb{Q}_5^{(c)}(A_{1u}) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z83}}$ $\mathbb{Q}_1^{(c)}(A_{2u}) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z115}}$ $\mathbb{Q}_2^{(c)}(B_{1g}) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z116}}$ $\mathbb{Q}_2^{(c)}(B_{2g}) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z194}}$ $\mathbb{Q}_3^{(c)}(B_{2u}) = \mathbb{Q}_0^{(a)}(A_{1g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z217}}$ $\mathbb{Q}_5^{(c)}(B_{2u}) = \mathbb{Q}_2^{(a)}(A_{1g})\mathbb{Q}_3^{(s)}(B_{2u})$

$\boxed{\text{z270}}$ $$\mathbb{Q}_{2,1}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z271}}$ $$\mathbb{Q}_{2,2}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z305}}$ $$\mathbb{Q}_{1,1}^{(c)}(E_u) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_{3}^{(s)}(B_{2u})}{2}$$

$\boxed{\text{z306}}$ $$\mathbb{Q}_{1,2}^{(c)}(E_u) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_{3}^{(s)}(B_{2u})}{2}$$

- `Si2` : 'Si2' site-cluster
  * bra: $\langle p_x|$, $\langle p_y|$, $\langle p_z|$
  * ket: $|p_x\rangle$, $|p_y\rangle$, $|p_z\rangle$
  * wyckoff: `2c`

$\boxed{\text{z11}}$ $\mathbb{Q}_{0}^{(c)}(A_{1g}) = \mathbb{Q}_{0}^{(a)}(A_{1g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z12}}$ $\mathbb{Q}_{2}^{(c)}(A_{1g}) = \mathbb{Q}_{2}^{(a)}(A_{1g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z58}}$ $\mathbb{Q}_{1}^{(c)}(A_{2u}, a) = \mathbb{Q}_{0}^{(a)}(A_{1g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z84}}$ $\mathbb{Q}_{1}^{(c)}(A_{2u}, b) = \mathbb{Q}_{2}^{(a)}(A_{1g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z117}}$ $\mathbb{Q}_{2}^{(c)}(B_{1g}) = \mathbb{Q}_{2}^{(a)}(B_{1g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z118}}$ $\mathbb{Q}_{3}^{(c)}(B_{1u}) = \mathbb{Q}_{2}^{(a)}(B_{2g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z218}}$ $\mathbb{Q}_{2}^{(c)}(B_{2g}) = \mathbb{Q}_{2}^{(a)}(B_{2g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z219}}$ $\mathbb{Q}_{3}^{(c)}(B_{2u}) = \mathbb{Q}_{2}^{(a)}(B_{1g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z245}}$ $$\mathbb{Q}_{2,1}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z272}}$ $$\mathbb{Q}_{2,2}^{(c)}(E_g) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$$

$\boxed{\text{z307}}$ $\mathbb{Q}_{1,1}^{(c)}(E_u) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_g)\mathbb{Q}_{1}^{(s)}(A_{2u})}{2}$

$\boxed{\text{z308}}$ $\mathbb{Q}_{1,2}^{(c)}(E_u) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_{1}^{(s)}(A_{2u})}{2}$

- `U` : 'U' site-cluster
  * bra: $\langle f_2|$, $\langle f_1|$, $\langle f_{bz}|$, $\langle f_3|$, $\langle f_{3x}|$, $\langle f_{3y}|$, $\langle f_{az}|$
  * ket: $|f_2\rangle$, $|f_1\rangle$, $|f_{bz}\rangle$, $|f_3\rangle$, $|f_{3x}\rangle$, $|f_{3y}\rangle$, $|f_{az}\rangle$
  * wyckoff: `2c`

$\boxed{\text{z13}}$ $\mathbb{Q}_{0}^{(c)}(A_{1g}) = \mathbb{Q}_{0}^{(a)}(A_{1g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z14}}$ $\mathbb{Q}_{2}^{(c)}(A_{1g}) = \mathbb{Q}_{2}^{(a)}(A_{1g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z15}}$ $\mathbb{Q}_{4}^{(c)}(A_{1g}, 1) = \mathbb{Q}_{4}^{(a)}(A_{1g}, 1)\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z16}}$ $\mathbb{Q}_{4}^{(c)}(A_{1g}, 2) = \mathbb{Q}_{4}^{(a)}(A_{1g}, 2)\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z17}}$ $\mathbb{Q}_{6}^{(c)}(A_{1g}, 1) = \mathbb{Q}_{6}^{(a)}(A_{1g}, 1)\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z18}}$ $\mathbb{Q}_{6}^{(c)}(A_{1g}, 2) = \mathbb{Q}_{6}^{(a)}(A_{1g}, 2)\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z37}}$ $\mathbb{Q}_{5}^{(c)}(A_{1u}, a) = \mathbb{Q}_{4}^{(a)}(A_{2g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z38}}$ $\mathbb{Q}_{5}^{(c)}(A_{1u}, b) = \mathbb{Q}_{6}^{(a)}(A_{2g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z59}}$ $\mathbb{Q}_{4}^{(c)}(A_{2g}) = \mathbb{Q}_{4}^{(a)}(A_{2g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z60}}$ $\mathbb{Q}_{6}^{(c)}(A_{2g}) = \mathbb{Q}_{6}^{(a)}(A_{2g})\mathbb{Q}_{0}^{(s)}(A_{1g})$

$\boxed{\text{z61}}$ $\mathbb{Q}_{1}^{(c)}(A_{2u}, a) = \mathbb{Q}_{0}^{(a)}(A_{1g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z62}}$ $\mathbb{Q}_{1}^{(c)}(A_{2u}, b) = \mathbb{Q}_{2}^{(a)}(A_{1g})\mathbb{Q}_{1}^{(s)}(A_{2u})$

$\boxed{\text{z85}}$ $\mathbb{Q}_{3}^{(c)}(A_{2u}) = \frac{\sqrt{21}\mathbb{Q}_{4}^{(a)}(A_{1g}, 1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{6} + \frac{\sqrt{15}\mathbb{Q}_{4}^{(a)}(A_{1g}, 2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{6}$

$\boxed{\text{z86}}$ $\mathbb{Q}_5^{(c)}(A_{2u},1) = \frac{\sqrt{2}\mathbb{Q}_6^{(a)}(A_{1g},1)\mathbb{Q}_1^{(s)}(A_{2u})}{4} + \frac{\sqrt{14}\mathbb{Q}_6^{(a)}(A_{1g},2)\mathbb{Q}_1^{(s)}(A_{2u})}{4}$

$\boxed{\text{z87}}$ $\mathbb{Q}_5^{(c)}(A_{2u},2a) = \frac{\sqrt{15}\mathbb{Q}_4^{(a)}(A_{1g},1)\mathbb{Q}_1^{(s)}(A_{2u})}{6} - \frac{\sqrt{21}\mathbb{Q}_4^{(a)}(A_{1g},2)\mathbb{Q}_1^{(s)}(A_{2u})}{6}$

$\boxed{\text{z88}}$ $\mathbb{Q}_5^{(c)}(A_{2u},2b) = -\frac{\sqrt{14}\mathbb{Q}_6^{(a)}(A_{1g},1)\mathbb{Q}_1^{(s)}(A_{2u})}{4} + \frac{\sqrt{2}\mathbb{Q}_6^{(a)}(A_{1g},2)\mathbb{Q}_1^{(s)}(A_{2u})}{4}$

$\boxed{\text{z119}}$ $\mathbb{Q}_2^{(c)}(B_{1g}) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z120}}$ $\mathbb{Q}_4^{(c)}(B_{1g}) = \mathbb{Q}_4^{(a)}(B_{1g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z121}}$ $\mathbb{Q}_6^{(c)}(B_{1g},1) = \mathbb{Q}_6^{(a)}(B_{1g},1)\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z122}}$ $\mathbb{Q}_6^{(c)}(B_{1g},2) = \mathbb{Q}_6^{(a)}(B_{1g},2)\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z123}}$ $\mathbb{Q}_3^{(c)}(B_{1u},a) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_1^{(s)}(A_{2u})$

$\boxed{\text{z124}}$ $\mathbb{Q}_3^{(c)}(B_{1u},b) = \mathbb{Q}_4^{(a)}(B_{2g})\mathbb{Q}_1^{(s)}(A_{2u})$

$\boxed{\text{z125}}$ $\mathbb{Q}_5^{(c)}(B_{1u}) = -\mathbb{Q}_6^{(a)}(B_{2g},2)\mathbb{Q}_1^{(s)}(A_{2u})$

$\boxed{\text{z126}}$ $\mathbb{Q}_7^{(c)}(B_{1u},1) = \mathbb{Q}_6^{(a)}(B_{2g},1)\mathbb{Q}_1^{(s)}(A_{2u})$

$\boxed{\text{z127}}$ $\mathbb{Q}_2^{(c)}(B_{2g}) = \mathbb{Q}_2^{(a)}(B_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z128}}$ $\mathbb{Q}_4^{(c)}(B_{2g}) = \mathbb{Q}_4^{(a)}(B_{2g})\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z129}}$ $\mathbb{Q}_6^{(c)}(B_{2g},1) = \mathbb{Q}_6^{(a)}(B_{2g},1)\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z130}}$ $\mathbb{Q}_6^{(c)}(B_{2g},2) = \mathbb{Q}_6^{(a)}(B_{2g},2)\mathbb{Q}_0^{(s)}(A_{1g})$

$\boxed{\text{z195}}$ $\mathbb{Q}_3^{(c)}(B_{2u},a) = \mathbb{Q}_2^{(a)}(B_{1g})\mathbb{Q}_1^{(s)}(A_{2u})$

$\boxed{\text{z196}}$ $\mathbb{Q}_3^{(c)}(B_{2u},b) = -\mathbb{Q}_4^{(a)}(B_{1g})\mathbb{Q}_1^{(s)}(A_{2u})$

$\boxed{\text{z220}}$ $\mathbb{Q}_5^{(c)}(B_{2u}) = -\frac{\sqrt{11}\mathbb{Q}_6^{(a)}(B_{1g},1)\mathbb{Q}_1^{(s)}(A_{2u})}{4} + \frac{\sqrt{5}\mathbb{Q}_6^{(a)}(B_{1g},2)\mathbb{Q}_1^{(s)}(A_{2u})}{4}$

$\boxed{\text{z221}}$ $\mathbb{Q}_{7}^{(c)}(B_{2u},1) = \frac{\sqrt{5}\mathbb{Q}_{6}^{(a)}(B_{1g},1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4} + \frac{\sqrt{11}\mathbb{Q}_{6}^{(a)}(B_{1g},2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4}$

$\boxed{\text{z222}}$ $\mathbb{Q}_{2,1}^{(c)}(E_{g}) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_{g})\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z223}}$ $\mathbb{Q}_{2,2}^{(c)}(E_{g}) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_{g})\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z224}}$ $\mathbb{Q}_{4,1}^{(c)}(E_{g},1) = \frac{\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_{g},1)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z225}}$ $\mathbb{Q}_{4,2}^{(c)}(E_{g},1) = \frac{\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_{g},1)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z246}}$ $\mathbb{Q}_{4,1}^{(c)}(E_{g},2) = \frac{\sqrt{2}\mathbb{Q}_{4,1}^{(a)}(E_{g},2)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z247}}$ $\mathbb{Q}_{4,2}^{(c)}(E_{g},2) = \frac{\sqrt{2}\mathbb{Q}_{4,2}^{(a)}(E_{g},2)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z248}}$ $\mathbb{Q}_{6,1}^{(c)}(E_{g},1) = \frac{\sqrt{2}\mathbb{Q}_{6,1}^{(a)}(E_{g},1)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z249}}$ $\mathbb{Q}_{6,2}^{(c)}(E_{g},1) = \frac{\sqrt{2}\mathbb{Q}_{6,2}^{(a)}(E_{g},1)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z273}}$ $\mathbb{Q}_{6,1}^{(c)}(E_{g},2) = \frac{\sqrt{2}\mathbb{Q}_{6,1}^{(a)}(E_{g},2)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z274}}$ $\mathbb{Q}_{6,2}^{(c)}(E_{g},2) = \frac{\sqrt{2}\mathbb{Q}_{6,2}^{(a)}(E_{g},2)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z275}}$ $\mathbb{Q}_{6,1}^{(c)}(E_{g},3) = \frac{\sqrt{2}\mathbb{Q}_{6,1}^{(a)}(E_{g},3)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z276}}$ $\mathbb{Q}_{6,2}^{(c)}(E_{g},3) = \frac{\sqrt{2}\mathbb{Q}_{6,2}^{(a)}(E_{g},3)\mathbb{Q}_{0}^{(s)}(A_{1g})}{2}$

$\boxed{\text{z309}}$ $\mathbb{Q}_{1,1}^{(c)}(E_{u}) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E_{g})\mathbb{Q}_{1}^{(s)}(A_{2u})}{2}$

$\boxed{\text{z310}}$ $$\mathbb{Q}_{1,2}^{(c)}(E_u) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E_g)\mathbb{Q}_{1}^{(s)}(A_{2u})}{2}$$

$\boxed{\text{z311}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,1) = \frac{\sqrt{7}\mathbb{Q}_{4,2}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4} - \frac{\mathbb{Q}_{4,2}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4}$$

$\boxed{\text{z312}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,1) = \frac{\sqrt{7}\mathbb{Q}_{4,1}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4} - \frac{\mathbb{Q}_{4,1}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4}$$

$\boxed{\text{z313}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,2) = \frac{\mathbb{Q}_{4,2}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4} + \frac{\sqrt{7}\mathbb{Q}_{4,2}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4}$$

$\boxed{\text{z314}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,2) = \frac{\mathbb{Q}_{4,1}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4} + \frac{\sqrt{7}\mathbb{Q}_{4,1}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{4}$$

$\boxed{\text{z315}}$ $$\mathbb{Q}_{5,1}^{(c)}(E_u,1) = -\frac{\sqrt{6}\mathbb{Q}_{6,2}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{8} + \frac{3\sqrt{11}\mathbb{Q}_{6,2}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{16} + \frac{\sqrt{5}\mathbb{Q}_{6,2}^{(a)}(E_g,3)\mathbb{Q}_{1}^{(s)}(A_{2u})}{16}$$

$\boxed{\text{z316}}$ $$\mathbb{Q}_{5,2}^{(c)}(E_u,1) = -\frac{\sqrt{6}\mathbb{Q}_{6,1}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{8} + \frac{3\sqrt{11}\mathbb{Q}_{6,1}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{16} + \frac{\sqrt{5}\mathbb{Q}_{6,1}^{(a)}(E_g,3)\mathbb{Q}_{1}^{(s)}(A_{2u})}{16}$$

$\boxed{\text{z317}}$ $$\mathbb{Q}_{5,1}^{(c)}(E_u,2) = \frac{7\sqrt{290}\mathbb{Q}_{6,2}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{232} + \frac{\sqrt{4785}\mathbb{Q}_{6,2}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{464} + \frac{23\sqrt{87}\mathbb{Q}_{6,2}^{(a)}(E_g,3)\mathbb{Q}_{1}^{(s)}(A_{2u})}{464}$$

$\boxed{\text{z318}}$ $$\mathbb{Q}_{5,2}^{(c)}(E_u,2) = \frac{7\sqrt{290}\mathbb{Q}_{6,1}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{232} + \frac{\sqrt{4785}\mathbb{Q}_{6,1}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{464} + \frac{23\sqrt{87}\mathbb{Q}_{6,1}^{(a)}(E_g,3)\mathbb{Q}_{1}^{(s)}(A_{2u})}{464}$$

$\boxed{\text{z319}}$ $$\mathbb{Q}_{5,1}^{(c)}(E_u,3) = \frac{\sqrt{1914}\mathbb{Q}_{6,2}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{116} + \frac{13\sqrt{29}\mathbb{Q}_{6,2}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{232} - \frac{3\sqrt{1595}\mathbb{Q}_{6,2}^{(a)}(E_g,3)\mathbb{Q}_{1}^{(s)}(A_{2u})}{232}$$

$\boxed{\text{z320}}$ $$\mathbb{Q}_{5,2}^{(c)}(E_u,3) = \frac{\sqrt{1914}\mathbb{Q}_{6,1}^{(a)}(E_g,1)\mathbb{Q}_{1}^{(s)}(A_{2u})}{116} + \frac{13\sqrt{29}\mathbb{Q}_{6,1}^{(a)}(E_g,2)\mathbb{Q}_{1}^{(s)}(A_{2u})}{232} - \frac{3\sqrt{1595}\mathbb{Q}_{6,1}^{(a)}(E_g,3)\mathbb{Q}_{1}^{(s)}(A_{2u})}{232}$$

- `Si2;Pt1_001_1` : '`Pt1`'-'`Si2`' bond-cluster
  - * bra: $\langle d_v|$, $\langle d_{xy}|$, $\langle d_{xz}|$, $\langle d_{yz}|$, $\langle d_u|$
  - * ket: $|p_x\rangle$, $|p_y\rangle$, $|p_z\rangle$
  - * wyckoff: `8a@8i`

$\boxed{\text{z27}}$ $$\mathbb{Q}_{0}^{(c)}(A_{1g},a) = \frac{\sqrt{3}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{1}^{(b)}(A_{2u})}{3}$$

$\boxed{\text{z28}}$ $\mathbb{Q}_0^{(c)}(A_{1g},b)=\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z29}}$ $\mathbb{Q}_2^{(c)}(A_{1g},a)=-\frac{\sqrt{6}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{6}-\frac{\sqrt{6}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{6}+\frac{\sqrt{6}\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z30}}$ $\mathbb{Q}_2^{(c)}(A_{1g},b)=-\frac{\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14}-\frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14}-\frac{\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14}-\frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14}+\frac{\sqrt{21}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{7}$

$\boxed{\text{z31}}$ $\mathbb{Q}_2^{(c)}(A_{1g},c)=-\frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}-\frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$

$\boxed{\text{z32}}$ $\mathbb{Q}_2^{(c)}(A_{1g},d)=-\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z33}}$ $\mathbb{Q}_4^{(c)}(A_{1g},1)=\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3}+\frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3}+\frac{\sqrt{3}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z34}}$ $\mathbb{Q}_4^{(c)}(A_{1g},2)=-\frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{42}+\frac{3\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14}-\frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{42}+\frac{3\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14}+\frac{\sqrt{105}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{21}$

$\boxed{\text{z46}}$ $\mathbb{Q}_5^{(c)}(A_{1u})=\frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{14}-\frac{\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{14}-\frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{14}+\frac{\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{14}+\frac{\sqrt{21}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{7}$

$\boxed{\text{z47}}$ $\mathbb{G}_0^{(c)}(A_{1u})=\frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{3}-\frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{3}+\frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z48}}$ $\mathbb{G}_2^{(c)}(A_{1u},a)=\frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}-\frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z49}}$ $\mathbb{G}_2^{(c)}(A_{1u},b)=-\frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28}-\frac{5\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{84}+\frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28}+\frac{5\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{84}-\frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{21}$

$\boxed{\text{z50}}$ $\mathbb{G}_2^{(c)}(A_{1u},c)=\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z51}}$ $\mathbb{G}_2^{(c)}(A_{1u},d)=\frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{6}-\frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{6}-\frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z52}}$ $\mathbb{G}_4^{(c)}(A_{1u},1)=-\frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4}-\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{12}+\frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4}+\frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{12}+\frac{\sqrt{3}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z71}}$ $$\mathbb{Q}_4^{(c)}(A_{2g},a)=\frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4}-\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4}-\frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4}+\frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4}$$

$\boxed{\text{z72}}$ $$\mathbb{Q}_4^{(c)}(A_{2g},b)=\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_3^{(b)}(B_{2u})$$

$\boxed{\text{z73}}$ $$\mathbb{Q}_4^{(c)}(A_{2g},c)=-\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_3^{(b)}(B_{2u})$$

$\boxed{\text{z74}}$ $$\mathbb{G}_1^{(c)}(A_{2g},a)=\frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}-\frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}$$

$\boxed{\text{z75}}$ $$\mathbb{G}_1^{(c)}(A_{2g},b)=\frac{\sqrt{30}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{10}-\frac{\sqrt{30}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{10}+\frac{\sqrt{10}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{5}$$

$\boxed{\text{z76}}$ $$\mathbb{G}_3^{(c)}(A_{2g},a)=-\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4}-\frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4}+\frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4}+\frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4}$$

$\boxed{\text{z77}}$ $$\mathbb{G}_3^{(c)}(A_{2g},b)=-\frac{\sqrt{5}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{5}+\frac{\sqrt{5}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{5}+\frac{\sqrt{15}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{5}$$

$\boxed{\text{z78}}$ $$\mathbb{Q}_1^{(c)}(A_{2u},a)=\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_0^{(b)}(A_{1g})$$

$\boxed{\text{z96}}$ $$\mathbb{Q}_1^{(c)}(A_{2u},b)=\frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}+\frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$$

$\boxed{\text{z97}}$ $$\mathbb{Q}_1^{(c)}(A_{2u},c)=-\frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{7}-\frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{21}-\frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{7}-\frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{21}+\frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{21}$$

$\boxed{\text{z98}}$ $$\mathbb{Q}_1^{(c)}(A_{2u},d)=-\frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{6}-\frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{6}-\frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$$

$\boxed{\text{z99}}$ $$\mathbb{Q}_3^{(c)}(A_{2u},a)=\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_0^{(b)}(A_{1g})$$

$\boxed{\text{z100}}$ $$\mathbb{Q}_3^{(c)}(A_{2u},b)=-\frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28}-\frac{5\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{84}-\frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28}-\frac{5\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{84}-\frac{4\sqrt{21}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{21}$$

$\boxed{\text{z101}}$ $$\mathbb{Q}_3^{(c)}(A_{2u},c)=-\frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{3}-\frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{3}+\frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$$

$\boxed{\text{z102}}$ $$\mathbb{Q}_5^{(c)}(A_{2u},2)=\frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4}-\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4}+\frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4}-\frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4}$$

$\boxed{\text{z161}}$ $\mathbb{Q}_2^{(c)}(B_{1g},a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2} - \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$

$\boxed{\text{z162}}$ $\mathbb{Q}_2^{(c)}(B_{1g},b) = \mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z163}}$ $\mathbb{Q}_2^{(c)}(B_{1g},c) = \frac{3\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} - \frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{42} - \frac{3\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} + \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{42} + \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{21}$

$\boxed{\text{z164}}$ $\mathbb{Q}_2^{(c)}(B_{1g},d) = -\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z165}}$ $\mathbb{Q}_2^{(c)}(B_{1g},e) = -\frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{6} + \frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{6} + \frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z166}}$ $\mathbb{Q}_4^{(c)}(B_{1g}) = \frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} + \frac{\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} - \frac{\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} - \frac{\sqrt{21}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{7}$

$\boxed{\text{z167}}$ $\mathbb{G}_3^{(c)}(B_{1g},a) = -\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} - \frac{\sqrt{3}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z168}}$ $\mathbb{G}_3^{(c)}(B_{1g},b) = \frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} - \frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z169}}$ $\mathbb{Q}_3^{(c)}(B_{1u},a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} + \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z170}}$ $\mathbb{Q}_3^{(c)}(B_{1u},b) = \mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z171}}$ $\mathbb{Q}_3^{(c)}(B_{1u},c) = -\frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} - \frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z172}}$ $\mathbb{Q}_3^{(c)}(B_{1u},d) = \mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_2^{(b)}(B_{1g})$

$\boxed{\text{z173}}$ $\mathbb{Q}_5^{(c)}(B_{1u}) = \frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} + \frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z174}}$ $\mathbb{G}_2^{(c)}(B_{1u},a) = \mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z175}}$ $\mathbb{G}_2^{(c)}(B_{1u},b) = -\frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} - \frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z176}}$ $\mathbb{Q}_2^{(c)}(B_{2g},a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2} + \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}$

$\boxed{\text{z177}}$ $\mathbb{Q}_2^{(c)}(B_{2g},b) = -\frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{7} + \frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{21} - \frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{7} + \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{21} + \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{21}$

$\boxed{\text{z178}}$ $\mathbb{Q}_2^{(c)}(B_{2g},c) = -\frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{6} - \frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{6} - \frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z179}}$ $\mathbb{Q}_2^{(c)}(B_{2g},d) = \mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z180}}$ $\mathbb{Q}_4^{(c)}(B_{2g}) = -\frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{28} - \frac{3\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{28} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{28} - \frac{3\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{28} + \frac{\sqrt{21}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{7}$

$\boxed{\text{z181}}$ $\mathbb{G}_3^{(c)}(B_{2g},a) = \frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4} + \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{12} + \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{12} + \frac{\sqrt{3}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z182}}$ $\mathbb{G}_3^{(c)}(B_{2g},b) = -\frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} - \frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z183}}$ $\mathbb{Q}_3^{(c)}(B_{2u},a) = \frac{\sqrt{3}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{3} - \frac{\sqrt{3}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{3} + \frac{\sqrt{3}\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z184}}$ $\mathbb{Q}_3^{(c)}(B_{2u},b) = \mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z185}}$ $\mathbb{Q}_3^{(c)}(B_{2u},c) = \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{12} - \frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4} - \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{12} + \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4} - \frac{\sqrt{3}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z186}}$ $\mathbb{Q}_5^{(c)}(B_{2u}) = -\frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{21} - \frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{7} + \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{21} + \frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{7} + \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{21}$

$\boxed{\text{z187}}$ $\mathbb{G}_2^{(c)}(B_{2u},a) = -\frac{\sqrt{6}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{6} + \frac{\sqrt{6}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{6} + \frac{\sqrt{6}\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z188}}$ $\mathbb{G}_2^{(c)}(B_{2u},b) = -\frac{3\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28} + \frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28} + \frac{3\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28} - \frac{\sqrt{21}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{7}$

$\boxed{\text{z189}}$ $\mathbb{G}_2^{(c)}(B_{2u},c) = \mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z190}}$ $\mathbb{G}_{2}^{(c)}(B_{2u},d)=\frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}-\frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$

$\boxed{\text{z204}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,a)=\frac{\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1}^{(b)}(A_{2u})}{2}+\frac{\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$

$\boxed{\text{z205}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g,a)=\frac{\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1}^{(b)}(A_{2u})}{2}+\frac{\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}$

$\boxed{\text{z206}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,b)=-\frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{3}^{(b)}(B_{2u})}{2}$

$\boxed{\text{z207}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g,b)=\frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{3}^{(b)}(B_{2u})}{2}$

$\boxed{\text{z208}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,c)=-\frac{\sqrt{14}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1}^{(b)}(A_{2u})}{14}-\frac{\sqrt{210}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1}^{(b)}(A_{2u})}{42}-\frac{\sqrt{14}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{14}+\frac{\sqrt{210}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{42}-\frac{\sqrt{210}\mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{42}$

$\boxed{\text{z209}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g,c)=-\frac{\sqrt{14}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1}^{(b)}(A_{2u})}{14}-\frac{\sqrt{210}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1}^{(b)}(A_{2u})}{42}-\frac{\sqrt{14}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{14}+\frac{\sqrt{210}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{42}+\frac{\sqrt{210}\mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{42}$

$\boxed{\text{z210}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,d)=-\frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{3}^{(b)}(B_{2u})}{8}+\frac{\sqrt{30}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{3}^{(b)}(B_{2u})}{8}$

$\boxed{\text{z234}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g,d)=\frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{3}^{(b)}(B_{2u})}{8}-\frac{\sqrt{30}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{3}^{(b)}(B_{2u})}{8}$

$\boxed{\text{z235}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,e)=\frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1}^{(b)}(A_{2u})}{6}+\frac{\mathbb{G}_{2}^{(a)}(A_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}+\frac{\sqrt{3}\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{6}+\frac{\sqrt{3}\mathbb{G}_{2}^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{6}$

$\boxed{\text{z236}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g,e)=\frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1}^{(b)}(A_{2u})}{6}-\frac{\mathbb{G}_{2}^{(a)}(A_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}+\frac{\sqrt{3}\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{6}-\frac{\sqrt{3}\mathbb{G}_{2}^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{6}$

$\boxed{\text{z237}}$ $\mathbb{Q}_{4,1}^{(c)}(E_g,1a)=\frac{\sqrt{10}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1}^{(b)}(A_{2u})}{8}+\frac{\sqrt{6}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1}^{(b)}(A_{2u})}{8}-\frac{\sqrt{10}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{8}-\frac{\sqrt{6}\mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{8}$

$\boxed{\text{z238}}$ $\mathbb{Q}_{4,2}^{(c)}(E_g,1a)=\frac{\sqrt{10}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1}^{(b)}(A_{2u})}{8}+\frac{\sqrt{6}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1}^{(b)}(A_{2u})}{8}-\frac{\sqrt{10}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{8}+\frac{\sqrt{6}\mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{8}$

$\boxed{\text{z239}}$ $\mathbb{Q}_{4,1}^{(c)}(E_g,1b)=-\frac{\sqrt{30}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{3}^{(b)}(B_{2u})}{8}-\frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{3}^{(b)}(B_{2u})}{8}$

$\boxed{\text{z240}}$ $\mathbb{Q}_{4,2}^{(c)}(E_g,1b)=\frac{\sqrt{30}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_3^{(b)}(B_{2u})}{8}+\frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_3^{(b)}(B_{2u})}{8}$

$\boxed{\text{z241}}$ $\mathbb{Q}_{4,1}^{(c)}(E_g,1c)=-\frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_3^{(b)}(B_{2u})}{2}$

$\boxed{\text{z257}}$ $\mathbb{Q}_{4,2}^{(c)}(E_g,1c)=\frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_3^{(b)}(B_{2u})}{2}$

$\boxed{\text{z258}}$ $\mathbb{Q}_{4,1}^{(c)}(E_g,2)=-\frac{\sqrt{70}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{56}+\frac{3\sqrt{42}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{56}-\frac{\sqrt{70}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{56}+\frac{\sqrt{42}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{14}+\frac{3\sqrt{42}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{56}$

$\boxed{\text{z259}}$ $\mathbb{Q}_{4,2}^{(c)}(E_g,2)=-\frac{\sqrt{70}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{56}+\frac{3\sqrt{42}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{56}-\frac{\sqrt{70}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{56}+\frac{\sqrt{42}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{14}-\frac{3\sqrt{42}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{56}$

$\boxed{\text{z260}}$ $\mathbb{G}_{1,1}^{(c)}(E_g,a)=\frac{\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{2}-\frac{\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$

$\boxed{\text{z261}}$ $\mathbb{G}_{1,2}^{(c)}(E_g,a)=\frac{\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{2}-\frac{\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}$

$\boxed{\text{z262}}$ $\mathbb{G}_{1,1}^{(c)}(E_g,b)=-\frac{\sqrt{15}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{10}-\frac{\sqrt{5}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{10}+\frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{10}+\frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{10}$

$\boxed{\text{z263}}$ $\mathbb{G}_{1,2}^{(c)}(E_g,b)=-\frac{\sqrt{15}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{10}+\frac{\sqrt{5}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{10}+\frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{10}-\frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{10}$

$\boxed{\text{z285}}$ $\mathbb{G}_{3,1}^{(c)}(E_g,1a)=-\frac{\sqrt{6}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{8}+\frac{\sqrt{10}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{8}+\frac{\sqrt{6}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{8}-\frac{\sqrt{10}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{8}$

$\boxed{\text{z286}}$ $\mathbb{G}_{3,2}^{(c)}(E_g,1a)=-\frac{\sqrt{6}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{8}+\frac{\sqrt{10}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{8}+\frac{\sqrt{6}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{8}+\frac{\sqrt{10}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{8}$

$\boxed{\text{z287}}$ $\mathbb{G}_{3,1}^{(c)}(E_g,1b)=\frac{\sqrt{10}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{10}-\frac{\sqrt{30}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{20}+\frac{3\sqrt{10}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{20}-\frac{\sqrt{10}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{10}$

$\boxed{\text{z288}}$ $\mathbb{G}_{3,2}^{(c)}(E_g,1b)=\frac{\sqrt{10}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{10}+\frac{\sqrt{30}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{20}+\frac{3\sqrt{10}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{20}+\frac{\sqrt{10}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{10}$

$\boxed{\text{z289}}$ $\mathbb{G}_{3,1}^{(c)}(E_g,2a)=\frac{\sqrt{10}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{8}-\frac{\sqrt{6}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{24}+\frac{\sqrt{10}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{8}+\frac{\sqrt{6}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{6}-\frac{\sqrt{6}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{24}$

$\boxed{\text{z290}}$ $\mathbb{G}^{(c)}_{3,2}(E_g, 2a) = \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3,1}(E_u, 1)\mathbb{Q}^{(b)}_{1}(A_{2u})}{8} - \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3,1}(E_u, 2)\mathbb{Q}^{(b)}_{1}(A_{2u})}{24} + \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{8} + \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{6} + \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{24}$

$\boxed{\text{z291}}$ $\mathbb{G}^{(c)}_{3,1}(E_g, 2b) = \frac{\sqrt{6}\mathbb{G}^{(a)}_{2,2}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{6} - \frac{\sqrt{2}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{4} - \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{12} + \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{6}$

$\boxed{\text{z292}}$ $\mathbb{G}^{(c)}_{3,2}(E_g, 2b) = \frac{\sqrt{6}\mathbb{G}^{(a)}_{2,1}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{6} + \frac{\sqrt{2}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{4} - \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{12} - \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{6}$

$\boxed{\text{z351}}$ $\mathbb{Q}^{(c)}_{1,1}(E_u, a) = \frac{\sqrt{2}\mathbb{Q}^{(a)}_{1,1}(E_u)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z352}}$ $\mathbb{Q}^{(c)}_{1,2}(E_u, a) = \frac{\sqrt{2}\mathbb{Q}^{(a)}_{1,2}(E_u)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z353}}$ $\mathbb{Q}^{(c)}_{1,1}(E_u, b) = \frac{\mathbb{Q}^{(a)}_{1,1}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2} + \frac{\mathbb{Q}^{(a)}_{1}(A_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{2}$

$\boxed{\text{z354}}$ $\mathbb{Q}^{(c)}_{1,2}(E_u, b) = -\frac{\mathbb{Q}^{(a)}_{1,2}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2} + \frac{\mathbb{Q}^{(a)}_{1}(A_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{2}$

$\boxed{\text{z355}}$ $\mathbb{Q}^{(c)}_{1,1}(E_u, c) = \frac{3\sqrt{14}\mathbb{Q}^{(a)}_{3,1}(E_u, 1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{28} - \frac{\sqrt{210}\mathbb{Q}^{(a)}_{3,1}(E_u, 2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{84} - \frac{\sqrt{14}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{14} + \frac{\sqrt{210}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{42} + \frac{\sqrt{210}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{42}$

$\boxed{\text{z356}}$ $\mathbb{Q}^{(c)}_{1,2}(E_u, c) = -\frac{3\sqrt{14}\mathbb{Q}^{(a)}_{3,2}(E_u, 1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{28} + \frac{\sqrt{210}\mathbb{Q}^{(a)}_{3,2}(E_u, 2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{84} - \frac{\sqrt{14}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{14} + \frac{\sqrt{210}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{42} - \frac{\sqrt{210}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{42}$

$\boxed{\text{z357}}$ $\mathbb{Q}^{(c)}_{1,1}(E_u, d) = \frac{\sqrt{3}\mathbb{G}^{(a)}_{2,1}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{6} - \frac{\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{2} - \frac{\sqrt{3}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{6} + \frac{\sqrt{3}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{6}$

$\boxed{\text{z358}}$ $\mathbb{Q}^{(c)}_{1,2}(E_u, d) = -\frac{\sqrt{3}\mathbb{G}^{(a)}_{2,2}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{6} + \frac{\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{2} - \frac{\sqrt{3}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{6} - \frac{\sqrt{3}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{6}$

$\boxed{\text{z359}}$ $\mathbb{Q}^{(c)}_{3,1}(E_u, 1a) = \frac{\mathbb{Q}^{(a)}_{1,1}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2} - \frac{\mathbb{Q}^{(a)}_{1}(A_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{2}$

$\boxed{\text{z360}}$ $\mathbb{Q}^{(c)}_{3,2}(E_u, 1a) = -\frac{\mathbb{Q}^{(a)}_{1,2}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2} - \frac{\mathbb{Q}^{(a)}_{1}(A_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{2}$

$\boxed{\text{z361}}$ $\mathbb{Q}^{(c)}_{3,1}(E_u, 1b) = \frac{\sqrt{2}\mathbb{Q}^{(a)}_{3,1}(E_u, 1)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z362}}$ $\mathbb{Q}^{(c)}_{3,2}(E_u,1b)=\frac{\sqrt{2}\mathbb{Q}^{(a)}_{3,2}(E_u,1)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z363}}$ $\mathbb{Q}^{(c)}_{3,1}(E_u,1c)=\frac{33\sqrt{1834}\mathbb{Q}^{(a)}_{3,1}(E_u,1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{3668}+\frac{17\sqrt{27510}\mathbb{Q}^{(a)}_{3,1}(E_u,2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{11004}-\frac{2\sqrt{1834}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{917}-\frac{17\sqrt{27510}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{5502}+\frac{2\sqrt{27510}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{2751}$

$\boxed{\text{z364}}$ $\mathbb{Q}^{(c)}_{3,2}(E_u,1c)=-\frac{33\sqrt{1834}\mathbb{Q}^{(a)}_{3,2}(E_u,1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{3668}-\frac{17\sqrt{27510}\mathbb{Q}^{(a)}_{3,2}(E_u,2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{11004}-\frac{2\sqrt{1834}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{917}-\frac{17\sqrt{27510}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{5502}-\frac{2\sqrt{27510}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{2751}$

$\boxed{\text{z365}}$ $\mathbb{Q}^{(c)}_{3,1}(E_u,1d)=-\frac{\sqrt{15}\mathbb{G}^{(a)}_{2,1}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{30}+\frac{\sqrt{5}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{10}+\frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{30}+\frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{6}$

$\boxed{\text{z366}}$ $\mathbb{Q}^{(c)}_{3,2}(E_u,1d)=\frac{\sqrt{15}\mathbb{G}^{(a)}_{2,2}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{30}-\frac{\sqrt{5}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{10}+\frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{30}-\frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{6}$

$\boxed{\text{z367}}$ $\mathbb{Q}^{(c)}_{3,1}(E_u,2a)=\frac{\sqrt{2}\mathbb{Q}^{(a)}_{3,1}(E_u,2)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z368}}$ $\mathbb{Q}^{(c)}_{3,2}(E_u,2a)=\frac{\sqrt{2}\mathbb{Q}^{(a)}_{3,2}(E_u,2)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z369}}$ $\mathbb{Q}^{(c)}_{3,1}(E_u,2b)=\frac{25\sqrt{655}\mathbb{Q}^{(a)}_{3,1}(E_u,1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2096}-\frac{5\sqrt{393}\mathbb{Q}^{(a)}_{3,1}(E_u,2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2096}-\frac{7\sqrt{655}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{1048}+\frac{5\sqrt{393}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{1048}-\frac{4\sqrt{393}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{131}$

$\boxed{\text{z370}}$ $\mathbb{Q}^{(c)}_{3,2}(E_u,2b)=-\frac{25\sqrt{655}\mathbb{Q}^{(a)}_{3,2}(E_u,1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2096}+\frac{5\sqrt{393}\mathbb{Q}^{(a)}_{3,2}(E_u,2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2096}-\frac{7\sqrt{655}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{1048}+\frac{5\sqrt{393}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{1048}+\frac{4\sqrt{393}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{131}$

$\boxed{\text{z371}}$ $\mathbb{Q}^{(c)}_{3,1}(E_u,2c)=\frac{\sqrt{15}\mathbb{G}^{(a)}_{2,1}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{10}+\frac{\sqrt{5}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{5}-\frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{10}$

$\boxed{\text{z372}}$ $\mathbb{Q}^{(c)}_{3,2}(E_u,2c)=-\frac{\sqrt{15}\mathbb{G}^{(a)}_{2,2}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{10}-\frac{\sqrt{5}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{5}-\frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{10}$

$\boxed{\text{z373}}$ $\mathbb{Q}^{(c)}_{5,1}(E_u,1)=\frac{5\mathbb{Q}^{(a)}_{3,1}(E_u,1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{16}-\frac{\sqrt{15}\mathbb{Q}^{(a)}_{3,1}(E_u,2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{80}+\frac{5\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{8}+\frac{\sqrt{15}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{40}$

$\boxed{\text{z374}}$ $\mathbb{Q}^{(c)}_{5,2}(E_u,1)=-\frac{5\mathbb{Q}^{(a)}_{3,2}(E_u,1)\mathbb{Q}^{(b)}_{2}(B_{1g})}{16}+\frac{\sqrt{15}\mathbb{Q}^{(a)}_{3,2}(E_u,2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{80}+\frac{5\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{8}+\frac{\sqrt{15}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{40}$

$\boxed{\text{z375}}$ $\mathbb{Q}^{(c)}_{5,1}(E_u,2)=-\frac{\sqrt{10}\mathbb{Q}^{(a)}_{3,1}(E_u,2)\mathbb{Q}^{(b)}_{2}(B_{1g})}{5}-\frac{\sqrt{10}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{2,1}(E_g)}{10}$

$\boxed{\text{z376}}$ $\mathbb{Q}_{5,2}^{(c)}(E_u,2) = \frac{\sqrt{10}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2}^{(b)}(B_{1g})}{5} - \frac{\sqrt{10}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{10}$

$\boxed{\text{z377}}$ $\mathbb{G}_{2,1}^{(c)}(E_u,a) = \frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{0}^{(b)}(A_{1g})}{2}$

$\boxed{\text{z378}}$ $\mathbb{G}_{2,2}^{(c)}(E_u,a) = \frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{0}^{(b)}(A_{1g})}{2}$

$\boxed{\text{z379}}$ $\mathbb{G}_{2,1}^{(c)}(E_u,b) = -\frac{\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2} - \frac{\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$

$\boxed{\text{z380}}$ $\mathbb{G}_{2,2}^{(c)}(E_u,b) = \frac{\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2} - \frac{\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

- `Si1;Pt2_001_1` : '`Pt2`'-'`Si1`' bond-cluster
  - * bra: $\langle d_v|$, $\langle d_{xy}|$, $\langle d_{xz}|$, $\langle d_{yz}|$, $\langle d_u|$
  - * ket: $|p_x\rangle$, $|p_y\rangle$, $|p_z\rangle$
  - * wyckoff: `8a@8i`

$\boxed{\text{z19}}$ $\mathbb{Q}_{0}^{(c)}(A_{1g},a) = \frac{\sqrt{3}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{1}^{(b)}(A_{2u})}{3}$

$\boxed{\text{z20}}$ $\mathbb{Q}_{0}^{(c)}(A_{1g},b) = \mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{3}^{(b)}(B_{2u})$

$\boxed{\text{z21}}$ $\mathbb{Q}_{2}^{(c)}(A_{1g},a) = -\frac{\sqrt{6}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{6} - \frac{\sqrt{6}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{6} + \frac{\sqrt{6}\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{1}^{(b)}(A_{2u})}{3}$

$\boxed{\text{z22}}$ $\mathbb{Q}_{2}^{(c)}(A_{1g},b) = -\frac{\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} - \frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} - \frac{\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} + \frac{\sqrt{21}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{1}^{(b)}(A_{2u})}{7}$

$\boxed{\text{z23}}$ $\mathbb{Q}_{2}^{(c)}(A_{1g},c) = -\frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2} - \frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$

$\boxed{\text{z24}}$ $\mathbb{Q}_{2}^{(c)}(A_{1g},d) = -\mathbb{G}_{2}^{(a)}(B_{2u})\mathbb{Q}_{3}^{(b)}(B_{2u})$

$\boxed{\text{z25}}$ $\mathbb{Q}_{4}^{(c)}(A_{1g},1) = \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{1}^{(b)}(A_{2u})}{3}$

$\boxed{\text{z26}}$ $\mathbb{Q}_4^{(c)}(A_{1g},2) = -\frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{42} + \frac{3\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} - \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{42} + \frac{3\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} + \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{21}$

$\boxed{\text{z39}}$ $\mathbb{Q}_5^{(c)}(A_{1u}) = \frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{14} - \frac{\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{14} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{14} + \frac{\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{14} + \frac{\sqrt{21}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{7}$

$\boxed{\text{z40}}$ $\mathbb{G}_0^{(c)}(A_{1u}) = \frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{3} - \frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{3} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z41}}$ $\mathbb{G}_2^{(c)}(A_{1u},a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} - \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z42}}$ $\mathbb{G}_2^{(c)}(A_{1u},b) = -\frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28} - \frac{5\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{84} + \frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28} + \frac{5\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{84} - \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{21}$

$\boxed{\text{z43}}$ $\mathbb{G}_2^{(c)}(A_{1u},c) = \mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z44}}$ $\mathbb{G}_2^{(c)}(A_{1u},d) = \frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{6} - \frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{6} - \frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z45}}$ $\mathbb{G}_4^{(c)}(A_{1u},1) = -\frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4} - \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{12} + \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{12} + \frac{\sqrt{3}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z63}}$ $\mathbb{Q}_4^{(c)}(A_{2g},a) = \frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4} - \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4} - \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4}$

$\boxed{\text{z64}}$ $\mathbb{Q}_4^{(c)}(A_{2g},b) = \mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z65}}$ $\mathbb{Q}_4^{(c)}(A_{2g},c) = -\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z66}}$ $\mathbb{G}_1^{(c)}(A_{2g},a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2} - \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}$

$\boxed{\text{z67}}$ $\mathbb{G}_1^{(c)}(A_{2g},b) = \frac{\sqrt{30}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{10} - \frac{\sqrt{30}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{10} + \frac{\sqrt{10}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{5}$

$\boxed{\text{z68}}$ $\mathbb{G}_3^{(c)}(A_{2g},a) = -\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4} - \frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4} + \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4}$

$\boxed{\text{z69}}$ $\mathbb{G}_3^{(c)}(A_{2g}, b) = -\frac{\sqrt{5}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{5} + \frac{\sqrt{5}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{5} + \frac{\sqrt{15}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{5}$

$\boxed{\text{z70}}$ $\mathbb{Q}_1^{(c)}(A_{2u}, a) = \mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z89}}$ $\mathbb{Q}_1^{(c)}(A_{2u}, b) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2} + \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$

$\boxed{\text{z90}}$ $\mathbb{Q}_1^{(c)}(A_{2u}, c) = -\frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u, 1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{7} - \frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u, 2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{21} - \frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u, 1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{7} - \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u, 2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{21} + \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{21}$

$\boxed{\text{z91}}$ $\mathbb{Q}_1^{(c)}(A_{2u}, d) = -\frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{6} - \frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{6} - \frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z92}}$ $\mathbb{Q}_3^{(c)}(A_{2u}, a) = \mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z93}}$ $\mathbb{Q}_3^{(c)}(A_{2u}, b) = -\frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u, 1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28} - \frac{5\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u, 2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{84} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u, 1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28} - \frac{5\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u, 2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{84} - \frac{4\sqrt{21}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{21}$

$\boxed{\text{z94}}$ $\mathbb{Q}_3^{(c)}(A_{2u}, c) = -\frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{3} - \frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{3} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_2^{(b)}(B_{1g})}{3}$

$\boxed{\text{z95}}$ $\mathbb{Q}_5^{(c)}(A_{2u}, 2) = \frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u, 1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4} - \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u, 2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4} + \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u, 1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4} - \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u, 2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4}$

$\boxed{\text{z131}}$ $\mathbb{Q}_2^{(c)}(B_{1g}, a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2} - \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$

$\boxed{\text{z132}}$ $\mathbb{Q}_2^{(c)}(B_{1g}, b) = \mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z133}}$ $\mathbb{Q}_2^{(c)}(B_{1g}, c) = \frac{3\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u, 1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} - \frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u, 2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{42} - \frac{3\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u, 1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} + \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u, 2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{42} + \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{21}$

$\boxed{\text{z134}}$ $\mathbb{Q}_2^{(c)}(B_{1g}, d) = -\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z135}}$ $\mathbb{Q}_2^{(c)}(B_{1g}, e) = -\frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{6} + \frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{6} + \frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z136}}$ $\mathbb{Q}_4^{(c)}(B_{1g}) = \frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u, 1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} + \frac{\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u, 2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u, 1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} - \frac{\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u, 2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} - \frac{\sqrt{21}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{7}$

$\boxed{\text{z137}}$ $\mathbb{G}_3^{(c)}(B_{1g},a) = -\frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} - \frac{\sqrt{3}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z138}}$ $\mathbb{G}_3^{(c)}(B_{1g},b) = \frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} - \frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z139}}$ $\mathbb{Q}_3^{(c)}(B_{1u},a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} + \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z140}}$ $\mathbb{Q}_3^{(c)}(B_{1u},b) = \mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z141}}$ $\mathbb{Q}_3^{(c)}(B_{1u},c) = -\frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} - \frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z142}}$ $\mathbb{Q}_3^{(c)}(B_{1u},d) = \mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_2^{(b)}(B_{1g})$

$\boxed{\text{z143}}$ $\mathbb{Q}_5^{(c)}(B_{1u}) = \frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} + \frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z144}}$ $\mathbb{G}_2^{(c)}(B_{1u},a) = \mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_0^{(b)}(A_{1g})$

$\boxed{\text{z145}}$ $\mathbb{G}_2^{(c)}(B_{1u},b) = -\frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} - \frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$

$\boxed{\text{z146}}$ $\mathbb{Q}_2^{(c)}(B_{2g},a) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{2} + \frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}$

$\boxed{\text{z147}}$ $\mathbb{Q}_2^{(c)}(B_{2g},b) = -\frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{7} + \frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{21} - \frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{7} + \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{21} + \frac{\sqrt{105}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{21}$

$\boxed{\text{z148}}$ $\mathbb{Q}_2^{(c)}(B_{2g},c) = -\frac{\sqrt{6}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{6} - \frac{\sqrt{6}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{6} - \frac{\sqrt{6}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z149}}$ $\mathbb{Q}_2^{(c)}(B_{2g},d) = \mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_3^{(b)}(B_{2u})$

$\boxed{\text{z150}}$ $\mathbb{Q}_4^{(c)}(B_{2g}) = -\frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{28} - \frac{3\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{28} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{28} - \frac{3\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{28} + \frac{\sqrt{21}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{7}$

$\boxed{\text{z151}}$ $\mathbb{G}_3^{(c)}(B_{2g},a) = \frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{1,2}^{(b)}(E_u)}{4} + \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{1,2}^{(b)}(E_u)}{12} + \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1,1}^{(b)}(E_u)}{4} + \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1,1}^{(b)}(E_u)}{12} + \frac{\sqrt{3}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_1^{(b)}(A_{2u})}{3}$

$\boxed{\text{z152}}$ $\mathbb{G}_{3}^{(c)}(B_{2g},b) = -\frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{1,2}^{(b)}(E_u)}{3} - \frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{1,1}^{(b)}(E_u)}{3} + \frac{\sqrt{3}\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{1}^{(b)}(A_{2u})}{3}$

$\boxed{\text{z153}}$ $\mathbb{Q}_{3}^{(c)}(B_{2u},a) = \frac{\sqrt{3}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{3} - \frac{\sqrt{3}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{3} + \frac{\sqrt{3}\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{2}^{(b)}(B_{1g})}{3}$

$\boxed{\text{z154}}$ $\mathbb{Q}_{3}^{(c)}(B_{2u},b) = \mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{0}^{(b)}(A_{1g})$

$\boxed{\text{z155}}$ $\mathbb{Q}_{3}^{(c)}(B_{2u},c) = \frac{\sqrt{3}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{12} - \frac{\sqrt{5}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{4} - \frac{\sqrt{3}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{12} + \frac{\sqrt{5}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{4} - \frac{\sqrt{3}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{2}^{(b)}(B_{1g})}{3}$

$\boxed{\text{z156}}$ $\mathbb{Q}_{5}^{(c)}(B_{2u}) = -\frac{\sqrt{105}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{21} - \frac{\sqrt{7}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{7} + \frac{\sqrt{105}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{21} + \frac{\sqrt{7}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{7} + \frac{\sqrt{105}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{2}^{(b)}(B_{1g})}{21}$

$\boxed{\text{z157}}$ $\mathbb{G}_{2}^{(c)}(B_{2u},a) = -\frac{\sqrt{6}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{6} + \frac{\sqrt{6}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{6} + \frac{\sqrt{6}\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{2}^{(b)}(B_{1g})}{3}$

$\boxed{\text{z158}}$ $\mathbb{G}_{2}^{(c)}(B_{2u},b) = -\frac{3\sqrt{21}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28} + \frac{\sqrt{35}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2,2}^{(b)}(E_g)}{28} + \frac{3\sqrt{21}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28} - \frac{\sqrt{35}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2,1}^{(b)}(E_g)}{28} - \frac{\sqrt{21}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{2}^{(b)}(B_{1g})}{7}$

$\boxed{\text{z159}}$ $\mathbb{G}_{2}^{(c)}(B_{2u},c) = \mathbb{G}_{2}^{(a)}(B_{2u})\mathbb{Q}_{0}^{(b)}(A_{1g})$

$\boxed{\text{z160}}$ $\mathbb{G}_{2}^{(c)}(B_{2u},d) = \frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2,2}^{(b)}(E_g)}{2} - \frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$

$\boxed{\text{z197}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,a) = \frac{\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{1}^{(b)}(A_{2u})}{2} + \frac{\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$

$\boxed{\text{z198}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g,a) = \frac{\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{1}^{(b)}(A_{2u})}{2} + \frac{\mathbb{Q}_{1}^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{2}$

$\boxed{\text{z199}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,b) = -\frac{\sqrt{2}\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_{3}^{(b)}(B_{2u})}{2}$

$\boxed{\text{z200}}$ $\mathbb{Q}_{2,2}^{(c)}(E_g,b) = \frac{\sqrt{2}\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_{3}^{(b)}(B_{2u})}{2}$

$\boxed{\text{z201}}$ $\mathbb{Q}_{2,1}^{(c)}(E_g,c) = -\frac{\sqrt{14}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{1}^{(b)}(A_{2u})}{14} - \frac{\sqrt{210}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{1}^{(b)}(A_{2u})}{42} - \frac{\sqrt{14}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} + \frac{\sqrt{210}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{42} - \frac{\sqrt{210}\mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{42}$

$\boxed{\text{z202}}$ $$\mathbb{Q}_{2,2}^{(c)}(E_g,c) = -\frac{\sqrt{14}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{14} - \frac{\sqrt{210}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{42} - \frac{\sqrt{14}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} + \frac{\sqrt{210}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{42} + \frac{\sqrt{210}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{42}$$

$\boxed{\text{z203}}$ $$\mathbb{Q}_{2,1}^{(c)}(E_g,d) = -\frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_3^{(b)}(B_{2u})}{8} + \frac{\sqrt{30}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_3^{(b)}(B_{2u})}{8}$$

$\boxed{\text{z226}}$ $$\mathbb{Q}_{2,2}^{(c)}(E_g,d) = \frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_3^{(b)}(B_{2u})}{8} - \frac{\sqrt{30}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_3^{(b)}(B_{2u})}{8}$$

$\boxed{\text{z227}}$ $$\mathbb{Q}_{2,1}^{(c)}(E_g,e) = \frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{6} + \frac{\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{2} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{6} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{6}$$

$\boxed{\text{z228}}$ $$\mathbb{Q}_{2,2}^{(c)}(E_g,e) = \frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{6} - \frac{\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{2} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{6} - \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{6}$$

$\boxed{\text{z229}}$ $$\mathbb{Q}_{4,1}^{(c)}(E_g,1a) = \frac{\sqrt{10}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{8} + \frac{\sqrt{6}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{8} - \frac{\sqrt{10}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{8} - \frac{\sqrt{6}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{8}$$

$\boxed{\text{z230}}$ $$\mathbb{Q}_{4,2}^{(c)}(E_g,1a) = \frac{\sqrt{10}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{8} + \frac{\sqrt{6}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{8} - \frac{\sqrt{10}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{8} + \frac{\sqrt{6}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{8}$$

$\boxed{\text{z231}}$ $$\mathbb{Q}_{4,1}^{(c)}(E_g,1b) = -\frac{\sqrt{30}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_3^{(b)}(B_{2u})}{8} - \frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_3^{(b)}(B_{2u})}{8}$$

$\boxed{\text{z232}}$ $$\mathbb{Q}_{4,2}^{(c)}(E_g,1b) = \frac{\sqrt{30}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_3^{(b)}(B_{2u})}{8} + \frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_3^{(b)}(B_{2u})}{8}$$

$\boxed{\text{z233}}$ $$\mathbb{Q}_{4,1}^{(c)}(E_g,1c) = -\frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_3^{(b)}(B_{2u})}{2}$$

$\boxed{\text{z250}}$ $$\mathbb{Q}_{4,2}^{(c)}(E_g,1c) = \frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_3^{(b)}(B_{2u})}{2}$$

$\boxed{\text{z251}}$ $$\mathbb{Q}_{4,1}^{(c)}(E_g,2) = -\frac{\sqrt{70}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{56} + \frac{3\sqrt{42}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{56} - \frac{\sqrt{70}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{56} + \frac{\sqrt{42}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{14} + \frac{3\sqrt{42}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{56}$$

$\boxed{\text{z252}}$ $$\mathbb{Q}_{4,2}^{(c)}(E_g,2) = -\frac{\sqrt{70}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_1^{(b)}(A_{2u})}{56} + \frac{3\sqrt{42}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_1^{(b)}(A_{2u})}{56} - \frac{\sqrt{70}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{56} + \frac{\sqrt{42}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{14} - \frac{3\sqrt{42}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{1,1}^{(b)}(E_u)}{56}$$

$\boxed{\text{z253}}$ $$\mathbb{G}_{1,1}^{(c)}(E_g,a) = \frac{\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_1^{(b)}(A_{2u})}{2} - \frac{\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_{1,2}^{(b)}(E_u)}{2}$$

$\boxed{\text{z254}}$ $\mathbb{G}^{(c)}_{1,2}(E_g, a) = \frac{\mathbb{Q}^{(a)}_{1,1}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{2} - \frac{\mathbb{Q}^{(a)}_{1}(A_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{2}$

$\boxed{\text{z255}}$ $\mathbb{G}^{(c)}_{1,1}(E_g, b) = -\frac{\sqrt{15}\mathbb{G}^{(a)}_{2,2}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{10} - \frac{\sqrt{5}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{10} + \frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{10} + \frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{10}$

$\boxed{\text{z256}}$ $\mathbb{G}^{(c)}_{1,2}(E_g, b) = -\frac{\sqrt{15}\mathbb{G}^{(a)}_{2,1}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{10} + \frac{\sqrt{5}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{10} + \frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{10} - \frac{\sqrt{15}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{10}$

$\boxed{\text{z277}}$ $\mathbb{G}^{(c)}_{3,1}(E_g, 1a) = -\frac{\sqrt{6}\mathbb{Q}^{(a)}_{3,2}(E_u,1)\mathbb{Q}^{(b)}_{1}(A_{2u})}{8} + \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3,2}(E_u,2)\mathbb{Q}^{(b)}_{1}(A_{2u})}{8} + \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{8} - \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{8}$

$\boxed{\text{z278}}$ $\mathbb{G}^{(c)}_{3,2}(E_g, 1a) = -\frac{\sqrt{6}\mathbb{Q}^{(a)}_{3,1}(E_u,1)\mathbb{Q}^{(b)}_{1}(A_{2u})}{8} + \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3,1}(E_u,2)\mathbb{Q}^{(b)}_{1}(A_{2u})}{8} + \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{8} + \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{8}$

$\boxed{\text{z279}}$ $\mathbb{G}^{(c)}_{3,1}(E_g, 1b) = \frac{\sqrt{10}\mathbb{G}^{(a)}_{2,2}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{10} - \frac{\sqrt{30}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{20} + \frac{3\sqrt{10}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{20} - \frac{\sqrt{10}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{10}$

$\boxed{\text{z280}}$ $\mathbb{G}^{(c)}_{3,2}(E_g, 1b) = \frac{\sqrt{10}\mathbb{G}^{(a)}_{2,1}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{10} + \frac{\sqrt{30}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{20} + \frac{3\sqrt{10}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{20} + \frac{\sqrt{10}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{10}$

$\boxed{\text{z281}}$ $\mathbb{G}^{(c)}_{3,1}(E_g, 2a) = \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3,2}(E_u,1)\mathbb{Q}^{(b)}_{1}(A_{2u})}{8} - \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3,2}(E_u,2)\mathbb{Q}^{(b)}_{1}(A_{2u})}{24} + \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{8} + \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{6} - \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{24}$

$\boxed{\text{z282}}$ $\mathbb{G}^{(c)}_{3,2}(E_g, 2a) = \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3,1}(E_u,1)\mathbb{Q}^{(b)}_{1}(A_{2u})}{8} - \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3,1}(E_u,2)\mathbb{Q}^{(b)}_{1}(A_{2u})}{24} + \frac{\sqrt{10}\mathbb{Q}^{(a)}_{3}(A_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{8} + \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(B_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{6} + \frac{\sqrt{6}\mathbb{Q}^{(a)}_{3}(B_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{24}$

$\boxed{\text{z283}}$ $\mathbb{G}^{(c)}_{3,1}(E_g, 2b) = \frac{\sqrt{6}\mathbb{G}^{(a)}_{2,2}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{6} - \frac{\sqrt{2}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{4} - \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{12} + \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{6}$

$\boxed{\text{z284}}$ $\mathbb{G}^{(c)}_{3,2}(E_g, 2b) = \frac{\sqrt{6}\mathbb{G}^{(a)}_{2,1}(E_u)\mathbb{Q}^{(b)}_{1}(A_{2u})}{6} + \frac{\sqrt{2}\mathbb{G}^{(a)}_{2}(A_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{4} - \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{1u})\mathbb{Q}^{(b)}_{1,2}(E_u)}{12} - \frac{\sqrt{6}\mathbb{G}^{(a)}_{2}(B_{2u})\mathbb{Q}^{(b)}_{1,1}(E_u)}{6}$

$\boxed{\text{z321}}$ $\mathbb{Q}^{(c)}_{1,1}(E_u, a) = \frac{\sqrt{2}\mathbb{Q}^{(a)}_{1,1}(E_u)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z322}}$ $\mathbb{Q}^{(c)}_{1,2}(E_u, a) = \frac{\sqrt{2}\mathbb{Q}^{(a)}_{1,2}(E_u)\mathbb{Q}^{(b)}_{0}(A_{1g})}{2}$

$\boxed{\text{z323}}$ $\mathbb{Q}^{(c)}_{1,1}(E_u, b) = \frac{\mathbb{Q}^{(a)}_{1,1}(E_u)\mathbb{Q}^{(b)}_{2}(B_{1g})}{2} + \frac{\mathbb{Q}^{(a)}_{1}(A_{2u})\mathbb{Q}^{(b)}_{2,2}(E_g)}{2}$

$\boxed{\text{z324}}$ $$\mathbb{Q}_{1,2}^{(c)}(E_u,b) = -\frac{\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_2^{(b)}(B_{1g})}{2} + \frac{\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$$

$\boxed{\text{z325}}$ $$\mathbb{Q}_{1,1}^{(c)}(E_u,c) = \frac{3\sqrt{14}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_2^{(b)}(B_{1g})}{28} - \frac{\sqrt{210}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_2^{(b)}(B_{1g})}{84} - \frac{\sqrt{14}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{14} + \frac{\sqrt{210}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{42} + \frac{\sqrt{210}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{42}$$

$\boxed{\text{z326}}$ $$\mathbb{Q}_{1,2}^{(c)}(E_u,c) = -\frac{3\sqrt{14}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_2^{(b)}(B_{1g})}{28} + \frac{\sqrt{210}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_2^{(b)}(B_{1g})}{84} - \frac{\sqrt{14}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{14} + \frac{\sqrt{210}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{42} - \frac{\sqrt{210}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{42}$$

$\boxed{\text{z327}}$ $$\mathbb{Q}_{1,1}^{(c)}(E_u,d) = \frac{\sqrt{3}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_2^{(b)}(B_{1g})}{6} - \frac{\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{2} - \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{6} + \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{6}$$

$\boxed{\text{z328}}$ $$\mathbb{Q}_{1,2}^{(c)}(E_u,d) = -\frac{\sqrt{3}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_2^{(b)}(B_{1g})}{6} + \frac{\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{2} - \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{6} - \frac{\sqrt{3}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{6}$$

$\boxed{\text{z329}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,1a) = \frac{\mathbb{Q}_{1,1}^{(a)}(E_u)\mathbb{Q}_2^{(b)}(B_{1g})}{2} - \frac{\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$$

$\boxed{\text{z330}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,1a) = -\frac{\mathbb{Q}_{1,2}^{(a)}(E_u)\mathbb{Q}_2^{(b)}(B_{1g})}{2} - \frac{\mathbb{Q}_1^{(a)}(A_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$$

$\boxed{\text{z331}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,1b) = \frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_0^{(b)}(A_{1g})}{2}$$

$\boxed{\text{z332}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,1b) = \frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_0^{(b)}(A_{1g})}{2}$$

$\boxed{\text{z333}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,1c) = \frac{33\sqrt{1834}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_2^{(b)}(B_{1g})}{3668} + \frac{17\sqrt{27510}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_2^{(b)}(B_{1g})}{11004} - \frac{2\sqrt{1834}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{917} - \frac{17\sqrt{27510}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{5502} + \frac{2\sqrt{27510}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{2751}$$

$\boxed{\text{z334}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,1c) = -\frac{33\sqrt{1834}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_2^{(b)}(B_{1g})}{3668} - \frac{17\sqrt{27510}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_2^{(b)}(B_{1g})}{11004} - \frac{2\sqrt{1834}\mathbb{Q}_3^{(a)}(A_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{917} - \frac{17\sqrt{27510}\mathbb{Q}_3^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{5502} - \frac{2\sqrt{27510}\mathbb{Q}_3^{(a)}(B_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{2751}$$

$\boxed{\text{z335}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,1d) = -\frac{\sqrt{15}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_2^{(b)}(B_{1g})}{30} + \frac{\sqrt{5}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{10} + \frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{30} + \frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{6}$$

$\boxed{\text{z336}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,1d) = \frac{\sqrt{15}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_2^{(b)}(B_{1g})}{30} - \frac{\sqrt{5}\mathbb{G}_2^{(a)}(A_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{10} + \frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{30} - \frac{\sqrt{15}\mathbb{G}_2^{(a)}(B_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{6}$$

$\boxed{\text{z337}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,2a) = \frac{\sqrt{2}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_0^{(b)}(A_{1g})}{2}$$

$\boxed{\text{z338}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,2a)=\frac{\sqrt{2}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{0}^{(b)}(A_{1g})}{2}$$

$\boxed{\text{z339}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,2b)=\frac{25\sqrt{655}\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2096}-\frac{5\sqrt{393}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2096}-\frac{7\sqrt{655}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{1048}+\frac{5\sqrt{393}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{1048}-\frac{4\sqrt{393}\mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{131}$$

$\boxed{\text{z340}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,2b)=-\frac{25\sqrt{655}\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2096}+\frac{5\sqrt{393}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2096}-\frac{7\sqrt{655}\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{1048}+\frac{5\sqrt{393}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{1048}+\frac{4\sqrt{393}\mathbb{Q}_{3}^{(a)}(B_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{131}$$

$\boxed{\text{z341}}$ $$\mathbb{Q}_{3,1}^{(c)}(E_u,2c)=\frac{\sqrt{15}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2}^{(b)}(B_{1g})}{10}+\frac{\sqrt{5}\mathbb{G}_{2}^{(a)}(A_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{5}-\frac{\sqrt{15}\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{10}$$

$\boxed{\text{z342}}$ $$\mathbb{Q}_{3,2}^{(c)}(E_u,2c)=-\frac{\sqrt{15}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2}^{(b)}(B_{1g})}{10}-\frac{\sqrt{5}\mathbb{G}_{2}^{(a)}(A_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{5}-\frac{\sqrt{15}\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{10}$$

$\boxed{\text{z343}}$ $$\mathbb{Q}_{5,1}^{(c)}(E_u,1)=\frac{5\mathbb{Q}_{3,1}^{(a)}(E_u,1)\mathbb{Q}_{2}^{(b)}(B_{1g})}{16}-\frac{\sqrt{15}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2}^{(b)}(B_{1g})}{80}+\frac{5\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{8}+\frac{\sqrt{15}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{40}$$

$\boxed{\text{z344}}$ $$\mathbb{Q}_{5,2}^{(c)}(E_u,1)=-\frac{5\mathbb{Q}_{3,2}^{(a)}(E_u,1)\mathbb{Q}_{2}^{(b)}(B_{1g})}{16}+\frac{\sqrt{15}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2}^{(b)}(B_{1g})}{80}+\frac{5\mathbb{Q}_{3}^{(a)}(A_{2u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{8}+\frac{\sqrt{15}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{40}$$

$\boxed{\text{z345}}$ $$\mathbb{Q}_{5,1}^{(c)}(E_u,2)=-\frac{\sqrt{10}\mathbb{Q}_{3,1}^{(a)}(E_u,2)\mathbb{Q}_{2}^{(b)}(B_{1g})}{5}-\frac{\sqrt{10}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{10}$$

$\boxed{\text{z346}}$ $$\mathbb{Q}_{5,2}^{(c)}(E_u,2)=\frac{\sqrt{10}\mathbb{Q}_{3,2}^{(a)}(E_u,2)\mathbb{Q}_{2}^{(b)}(B_{1g})}{5}-\frac{\sqrt{10}\mathbb{Q}_{3}^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{10}$$

$\boxed{\text{z347}}$ $$\mathbb{G}_{2,1}^{(c)}(E_u,a)=\frac{\sqrt{2}\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{0}^{(b)}(A_{1g})}{2}$$

$\boxed{\text{z348}}$ $$\mathbb{G}_{2,2}^{(c)}(E_u,a)=\frac{\sqrt{2}\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{0}^{(b)}(A_{1g})}{2}$$

$\boxed{\text{z349}}$ $$\mathbb{G}_{2,1}^{(c)}(E_u,b)=-\frac{\mathbb{G}_{2,1}^{(a)}(E_u)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2}-\frac{\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{2,1}^{(b)}(E_g)}{2}$$

$\boxed{\text{z350}}$ $$\mathbb{G}_{2,2}^{(c)}(E_u,b)=\frac{\mathbb{G}_{2,2}^{(a)}(E_u)\mathbb{Q}_{2}^{(b)}(B_{1g})}{2}-\frac{\mathbb{G}_{2}^{(a)}(B_{1u})\mathbb{Q}_{2,2}^{(b)}(E_g)}{2}$$

- bra: $\langle d_v|, \langle d_{xy}|, \langle d_{xz}|, \langle d_{yz}|, \langle d_u|$
- ket: $|d_v\rangle, |d_{xy}\rangle, |d_{xz}\rangle, |d_{yz}\rangle, |d_u\rangle$

$$\boxed{\text{x1}}\quad \mathbb{Q}_0^{(a)}(A_{1g}) = \begin{bmatrix} \frac{\sqrt{5}}{5} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{5}}{5} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{5}}{5} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{5}}{5} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{5}}{5} \end{bmatrix}$$

$$\boxed{\text{x2}}\quad \mathbb{Q}_2^{(a)}(A_{1g}) = \begin{bmatrix} -\frac{\sqrt{14}}{7} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{14}}{7} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{14} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{14}}{7} \end{bmatrix}$$

$$\boxed{\text{x3}}\quad \mathbb{Q}_4^{(a)}(A_{1g},1) = \begin{bmatrix} \frac{\sqrt{30}}{10} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{15} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{30}}{15} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{30}}{15} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{10} \end{bmatrix}$$

$$\boxed{\text{x4}}\quad \mathbb{Q}_4^{(a)}(A_{1g},2) = \begin{bmatrix} -\frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 \\ 0 & \frac{2\sqrt{42}}{21} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{21} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{21} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{14} \end{bmatrix}$$

$\boxed{\text{x5}}$ $$\mathbb{Q}_4^{(a)}(A_{2g}) = \begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 \\ \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x6}}$ $$\mathbb{Q}_2^{(a)}(B_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{7} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{14} & 0 \\ -\frac{\sqrt{14}}{7} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x7}}$ $$\mathbb{Q}_4^{(a)}(B_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{42}}{14} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{14}}{7} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{7} & 0 \\ -\frac{\sqrt{42}}{14} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x8}}$ $$\mathbb{Q}_2^{(a)}(B_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{14}}{7} \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 \\ 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 \\ 0 & -\frac{\sqrt{14}}{7} & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x9}}$ $$\mathbb{Q}_4^{(a)}(B_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{14} \\ 0 & 0 & 0 & \frac{\sqrt{14}}{7} & 0 \\ 0 & 0 & \frac{\sqrt{14}}{7} & 0 & 0 \\ 0 & \frac{\sqrt{42}}{14} & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x10}}$ $\mathbb{Q}_{2,1}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{42}}{14} & 0 \\ 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 \\ 0 & \frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ -\frac{\sqrt{42}}{14} & 0 & 0 & 0 & \frac{\sqrt{14}}{14} \\ 0 & 0 & 0 & \frac{\sqrt{14}}{14} & 0 \end{bmatrix}$

$\boxed{\text{x11}}$ $\mathbb{Q}_{2,2}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{42}}{14} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{42}}{14} & 0 \\ \frac{\sqrt{42}}{14} & 0 & 0 & 0 & \frac{\sqrt{14}}{14} \\ 0 & \frac{\sqrt{42}}{14} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{14}}{14} & 0 & 0 \end{bmatrix}$

$\boxed{\text{x12}}$ $\mathbb{Q}_{4,1}^{(a)}(E_g, 1) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & -\frac{\sqrt{6}}{4} \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{4} & 0 \end{bmatrix}$

$\boxed{\text{x13}}$ $\mathbb{Q}_{4,2}^{(a)}(E_g, 1) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & 0 & 0 & -\frac{\sqrt{6}}{4} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{4} & 0 & 0 \end{bmatrix}$

$\boxed{\text{x14}}$ $\mathbb{Q}_{4,1}^{(a)}(E_g, 2) = \begin{bmatrix} 0 & 0 & 0 & \frac{3\sqrt{14}}{28} & 0 \\ 0 & 0 & \frac{\sqrt{14}}{7} & 0 & 0 \\ 0 & \frac{\sqrt{14}}{7} & 0 & 0 & 0 \\ \frac{3\sqrt{14}}{28} & 0 & 0 & 0 & -\frac{\sqrt{42}}{28} \\ 0 & 0 & 0 & -\frac{\sqrt{42}}{28} & 0 \end{bmatrix}$

$$\boxed{\text{x15}} \quad \mathbb{Q}_{4,2}^{(a)}(E_g,2) = \begin{bmatrix} 0 & 0 & -\frac{3\sqrt{14}}{28} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{14}}{7} & 0 \\ -\frac{3\sqrt{14}}{28} & 0 & 0 & 0 & -\frac{\sqrt{42}}{28} \\ 0 & \frac{\sqrt{14}}{7} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}}{28} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x16}} \quad \mathbb{M}_{1}^{(a)}(A_{2g}) = \begin{bmatrix} 0 & -\frac{\sqrt{10}i}{5} & 0 & 0 & 0 \\ \frac{\sqrt{10}i}{5} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{10} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x17}} \quad \mathbb{M}_{3}^{(a)}(A_{2g}) = \begin{bmatrix} 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{5} & 0 \\ 0 & 0 & \frac{\sqrt{10}i}{5} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x18}} \quad \mathbb{M}_{3}^{(a)}(B_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{2} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x19}} \quad \mathbb{M}_{3}^{(a)}(B_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{2} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{2} & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x20}}$ $$\mathbb{M}^{(a)}_{1,1}(E_g) = \begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{10}i}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ -\frac{\sqrt{10}i}{10} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{30}i}{10} & 0 \end{bmatrix}$$

$\boxed{\text{x21}}$ $$\mathbb{M}^{(a)}_{1,2}(E_g) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{10} & 0 \\ \frac{\sqrt{10}i}{10} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{10} \\ 0 & \frac{\sqrt{10}i}{10} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{30}i}{10} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x22}}$ $$\mathbb{M}^{(a)}_{3,1}(E_g, 1) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{10}i}{20} & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{5} & 0 & 0 \\ 0 & \frac{\sqrt{10}i}{5} & 0 & 0 & 0 \\ \frac{\sqrt{10}i}{20} & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} \\ 0 & 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 \end{bmatrix}$$

$\boxed{\text{x23}}$ $$\mathbb{M}^{(a)}_{3,2}(E_g, 1) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{10}i}{20} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{10}i}{5} & 0 \\ -\frac{\sqrt{10}i}{20} & 0 & 0 & 0 & \frac{\sqrt{30}i}{20} \\ 0 & \frac{\sqrt{10}i}{5} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{30}i}{20} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x24}}$ $$\mathbb{M}^{(a)}_{3,1}(E_g, 2) = \begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{4} & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \end{bmatrix}$$

$\boxed{\text{x25}}$ $$\mathbb{M}_{3,2}^{(a)}(E_g,2) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}i}{4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}i}{4} & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{bmatrix}$$

- bra: $\langle p_x|$, $\langle p_y|$, $\langle p_z|$
- ket: $|p_x\rangle$, $|p_y\rangle$, $|p_z\rangle$

$\boxed{\text{x26}}$ $$\mathbb{Q}_{0}^{(a)}(A_{1g}) = \begin{bmatrix} \frac{\sqrt{3}}{3} & 0 & 0 \\ 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & \frac{\sqrt{3}}{3} \end{bmatrix}$$

$\boxed{\text{x27}}$ $$\mathbb{Q}_{2}^{(a)}(A_{1g}) = \begin{bmatrix} -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & \frac{\sqrt{6}}{3} \end{bmatrix}$$

$\boxed{\text{x28}}$ $$\mathbb{Q}_{2}^{(a)}(B_{1g}) = \begin{bmatrix} \frac{\sqrt{2}}{2} & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x29}}$ $$\mathbb{Q}_{2}^{(a)}(B_{2g}) = \begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & 0 \\ \frac{\sqrt{2}}{2} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x30}}$ $$\mathbb{Q}_{2,1}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}}{2} \\ 0 & \frac{\sqrt{2}}{2} & 0 \end{bmatrix}$$

$\boxed{\text{x31}}$ $$\mathbb{Q}_{2,2}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{2}}{2} \\ 0 & 0 & 0 \\ \frac{\sqrt{2}}{2} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x32}}$ $$\mathbb{M}_1^{(a)}(A_{2g}) = \begin{bmatrix} 0 & -\frac{\sqrt{2}i}{2} & 0 \\ \frac{\sqrt{2}i}{2} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x33}}$ $$\mathbb{M}_{1,1}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{2} \\ 0 & \frac{\sqrt{2}i}{2} & 0 \end{bmatrix}$$

$\boxed{\text{x34}}$ $$\mathbb{M}_{1,2}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{2}i}{2} \\ 0 & 0 & 0 \\ \frac{\sqrt{2}i}{2} & 0 & 0 \end{bmatrix}$$

- bra: $\langle f_2|$, $\langle f_1|$, $\langle f_{bz}|$, $\langle f_3|$, $\langle f_{3x}|$, $\langle f_{3y}|$, $\langle f_{az}|$
- ket: $|f_2\rangle$, $|f_1\rangle$, $|f_{bz}\rangle$, $|f_3\rangle$, $|f_{3x}\rangle$, $|f_{3y}\rangle$, $|f_{az}\rangle$

$\boxed{\text{x35}}$ $$\mathbb{Q}_0^{(a)}(A_{1g}) = \begin{bmatrix} \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{7}}{7} \end{bmatrix}$$

$\boxed{\text{x36}}$ $$\mathbb{Q}_2^{(a)}(A_{1g}) = \begin{bmatrix} -\frac{5\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{5\sqrt{21}}{42} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{21}}{14} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{2\sqrt{21}}{21} \end{bmatrix}$$

$\boxed{\text{x37}}$ $\mathbb{Q}_4^{(a)}(A_{1g},1) = \begin{bmatrix} \frac{\sqrt{66}}{44} & 0 & 0 & 0 & -\frac{\sqrt{110}}{44} & 0 & 0 \\ 0 & \frac{\sqrt{66}}{44} & 0 & 0 & 0 & \frac{\sqrt{110}}{44} & 0 \\ 0 & 0 & -\frac{\sqrt{66}}{66} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{66}}{11} & 0 & 0 & 0 \\ -\frac{\sqrt{110}}{44} & 0 & 0 & 0 & \frac{\sqrt{66}}{132} & 0 & 0 \\ 0 & \frac{\sqrt{110}}{44} & 0 & 0 & 0 & \frac{\sqrt{66}}{132} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{66}}{22} \end{bmatrix}$

$\boxed{\text{x38}}$ $\mathbb{Q}_4^{(a)}(A_{1g},2) = \begin{bmatrix} \frac{\sqrt{2310}}{308} & 0 & 0 & 0 & \frac{\sqrt{154}}{44} & 0 & 0 \\ 0 & \frac{\sqrt{2310}}{308} & 0 & 0 & 0 & -\frac{\sqrt{154}}{44} & 0 \\ 0 & 0 & -\frac{\sqrt{2310}}{66} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{154}}{44} & 0 & 0 & 0 & \frac{\sqrt{2310}}{924} & 0 & 0 \\ 0 & -\frac{\sqrt{154}}{44} & 0 & 0 & 0 & \frac{\sqrt{2310}}{924} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2310}}{154} \end{bmatrix}$

$\boxed{\text{x39}}$ $\mathbb{Q}_6^{(a)}(A_{1g},1) = \begin{bmatrix} -\frac{\sqrt{462}}{1848} & 0 & 0 & 0 & -\frac{\sqrt{770}}{88} & 0 & 0 \\ 0 & -\frac{\sqrt{462}}{1848} & 0 & 0 & 0 & \frac{\sqrt{770}}{88} & 0 \\ 0 & 0 & -\frac{3\sqrt{462}}{154} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{2\sqrt{462}}{77} & 0 & 0 & 0 \\ -\frac{\sqrt{770}}{88} & 0 & 0 & 0 & -\frac{5\sqrt{462}}{616} & 0 & 0 \\ 0 & \frac{\sqrt{770}}{88} & 0 & 0 & 0 & -\frac{5\sqrt{462}}{616} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{462}}{462} \end{bmatrix}$

$\boxed{\text{x40}}$ $\mathbb{Q}_6^{(a)}(A_{1g}, 2) = \begin{bmatrix} -\frac{\sqrt{66}}{264} & 0 & 0 & 0 & \frac{\sqrt{110}}{88} & 0 & 0 \\ 0 & -\frac{\sqrt{66}}{264} & 0 & 0 & 0 & -\frac{\sqrt{110}}{88} & 0 \\ 0 & 0 & \frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{110}}{88} & 0 & 0 & 0 & -\frac{5\sqrt{66}}{88} & 0 & 0 \\ 0 & -\frac{\sqrt{110}}{88} & 0 & 0 & 0 & -\frac{5\sqrt{66}}{88} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{5\sqrt{66}}{66} \end{bmatrix}$

$\boxed{\text{x41}}$ $\mathbb{Q}_4^{(a)}(A_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{22} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{110}}{22} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{110}}{22} & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{66}}{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

$\boxed{\text{x42}}$ $\mathbb{Q}_6^{(a)}(A_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{55}}{22} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{33}}{11} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{33}}{11} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{55}}{22} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{55}}{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

$\boxed{\text{x43}}$ $\mathbb{Q}_2^{(a)}(B_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{21} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 \\ 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & -\frac{\sqrt{7}}{7} & 0 \\ 0 & 0 & -\frac{\sqrt{105}}{21} & 0 & 0 & 0 & 0 \end{bmatrix}$

$\boxed{\text{x44}}$ $\mathbb{Q}_4^{(a)}(B_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{3\sqrt{462}}{154} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{462}}{154} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{462}}{154} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{3\sqrt{462}}{154} & 0 & 0 & 0 & -\frac{\sqrt{770}}{77} & 0 & 0 \\ 0 & -\frac{3\sqrt{462}}{154} & 0 & 0 & 0 & \frac{\sqrt{770}}{77} & 0 \\ 0 & 0 & \frac{\sqrt{462}}{154} & 0 & 0 & 0 & 0 \end{bmatrix}$

$\boxed{\text{x45}}$ $\mathbb{Q}_6^{(a)}(B_{1g}, 1) = \begin{bmatrix} \frac{\sqrt{10}}{8} & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 & 0 \\ 0 & -\frac{\sqrt{10}}{8} & 0 & 0 & 0 & \frac{\sqrt{6}}{24} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{24} & 0 & 0 & 0 & -\frac{\sqrt{10}}{8} & 0 & 0 \\ 0 & \frac{\sqrt{6}}{24} & 0 & 0 & 0 & \frac{\sqrt{10}}{8} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \end{bmatrix}$

$$\boxed{\text{x46}} \quad \mathbb{Q}_6^{(a)}(B_{1g},2) = \begin{bmatrix} \frac{\sqrt{22}}{8} & 0 & 0 & 0 & -\frac{\sqrt{330}}{264} & 0 & 0 \\ 0 & -\frac{\sqrt{22}}{8} & 0 & 0 & 0 & -\frac{\sqrt{330}}{264} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{330}}{66} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{330}}{264} & 0 & 0 & 0 & \frac{5\sqrt{22}}{88} & 0 & 0 \\ 0 & -\frac{\sqrt{330}}{264} & 0 & 0 & 0 & -\frac{5\sqrt{22}}{88} & 0 \\ 0 & 0 & \frac{\sqrt{330}}{66} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x47}} \quad \mathbb{Q}_2^{(a)}(B_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{105}}{42} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{42} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{105}}{21} \\ 0 & -\frac{\sqrt{105}}{42} & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 \\ \frac{\sqrt{105}}{42} & 0 & 0 & 0 & \frac{\sqrt{7}}{7} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{105}}{21} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x48}} \quad \mathbb{Q}_4^{(a)}(B_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{3\sqrt{462}}{154} & 0 \\ 0 & 0 & 0 & 0 & \frac{3\sqrt{462}}{154} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{462}}{154} \\ 0 & \frac{3\sqrt{462}}{154} & 0 & 0 & 0 & \frac{\sqrt{770}}{77} & 0 \\ -\frac{3\sqrt{462}}{154} & 0 & 0 & 0 & \frac{\sqrt{770}}{77} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{462}}{154} & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x49}}$ $$\mathbb{Q}_{6}^{(a)}(B_{2g},1) = \begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}}{2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x50}}$ $$\mathbb{Q}_{6}^{(a)}(B_{2g},2) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{66}}{66} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{66}}{66} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{2\sqrt{66}}{33} \\ 0 & -\frac{\sqrt{66}}{66} & 0 & 0 & 0 & \frac{\sqrt{110}}{22} & 0 \\ \frac{\sqrt{66}}{66} & 0 & 0 & 0 & \frac{\sqrt{110}}{22} & 0 & 0 \\ 0 & 0 & 0 & \frac{2\sqrt{66}}{33} & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x51}}$ $$\mathbb{Q}_{2,1}^{(a)}(E_{g}) = \begin{bmatrix} 0 & 0 & 0 & -\frac{5\sqrt{42}}{84} & 0 & 0 & 0 \\ 0 & 0 & \frac{5\sqrt{42}}{84} & 0 & 0 & 0 & 0 \\ 0 & \frac{5\sqrt{42}}{84} & 0 & 0 & 0 & -\frac{\sqrt{70}}{28} & 0 \\ -\frac{5\sqrt{42}}{84} & 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{70}}{28} & 0 & 0 & 0 & \frac{\sqrt{42}}{42} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{42} & 0 \end{bmatrix}$$

$\boxed{\text{x52}}$ $$\mathbb{Q}_{2,2}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & \frac{5\sqrt{42}}{84} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{5\sqrt{42}}{84} & 0 & 0 & 0 \\ \frac{5\sqrt{42}}{84} & 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 \\ 0 & \frac{5\sqrt{42}}{84} & 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 \\ 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 & \frac{\sqrt{42}}{42} \\ 0 & 0 & 0 & \frac{\sqrt{70}}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{42}}{42} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x53}}$ $$\mathbb{Q}_{4,1}^{(a)}(E_g,1) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{165}}{44} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{165}}{44} & 0 & 0 & 0 & \frac{3\sqrt{11}}{44} \\ 0 & \frac{\sqrt{165}}{44} & 0 & 0 & 0 & \frac{3\sqrt{11}}{44} & 0 \\ -\frac{\sqrt{165}}{44} & 0 & 0 & 0 & -\frac{5\sqrt{11}}{44} & 0 & 0 \\ 0 & 0 & 0 & -\frac{5\sqrt{11}}{44} & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{11}}{44} & 0 & 0 & 0 & -\frac{\sqrt{165}}{44} \\ 0 & \frac{3\sqrt{11}}{44} & 0 & 0 & 0 & -\frac{\sqrt{165}}{44} & 0 \end{bmatrix}$$

$\boxed{\text{x54}}$ $$\mathbb{Q}_{4,2}^{(a)}(E_g,1) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{165}}{44} & 0 & 0 & 0 & -\frac{3\sqrt{11}}{44} \\ 0 & 0 & 0 & \frac{\sqrt{165}}{44} & 0 & 0 & 0 \\ \frac{\sqrt{165}}{44} & 0 & 0 & 0 & -\frac{3\sqrt{11}}{44} & 0 & 0 \\ 0 & \frac{\sqrt{165}}{44} & 0 & 0 & 0 & -\frac{5\sqrt{11}}{44} & 0 \\ 0 & 0 & -\frac{3\sqrt{11}}{44} & 0 & 0 & 0 & -\frac{\sqrt{165}}{44} \\ 0 & 0 & 0 & -\frac{5\sqrt{11}}{44} & 0 & 0 & 0 \\ -\frac{3\sqrt{11}}{44} & 0 & 0 & 0 & -\frac{\sqrt{165}}{44} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x55}}\quad \mathbb{Q}_{4,1}^{(a)}(E_g,2)=\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{1155}}{308} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{1155}}{308} & 0 & 0 & 0 & -\frac{3\sqrt{77}}{44} \\ 0 & \frac{\sqrt{1155}}{308} & 0 & 0 & 0 & \frac{\sqrt{77}}{28} & 0 \\ -\frac{\sqrt{1155}}{308} & 0 & 0 & 0 & \frac{3\sqrt{77}}{308} & 0 & 0 \\ 0 & 0 & 0 & \frac{3\sqrt{77}}{308} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{77}}{28} & 0 & 0 & 0 & -\frac{\sqrt{1155}}{308} \\ 0 & -\frac{3\sqrt{77}}{44} & 0 & 0 & 0 & -\frac{\sqrt{1155}}{308} & 0 \end{bmatrix}$$

$$\boxed{\text{x56}}\quad \mathbb{Q}_{4,2}^{(a)}(E_g,2)=\begin{bmatrix} 0 & 0 & \frac{\sqrt{1155}}{308} & 0 & 0 & 0 & \frac{3\sqrt{77}}{44} \\ 0 & 0 & 0 & \frac{\sqrt{1155}}{308} & 0 & 0 & 0 \\ \frac{\sqrt{1155}}{308} & 0 & 0 & 0 & -\frac{\sqrt{77}}{28} & 0 & 0 \\ 0 & \frac{\sqrt{1155}}{308} & 0 & 0 & 0 & \frac{3\sqrt{77}}{308} & 0 \\ 0 & 0 & -\frac{\sqrt{77}}{28} & 0 & 0 & 0 & -\frac{\sqrt{1155}}{308} \\ 0 & 0 & 0 & \frac{3\sqrt{77}}{308} & 0 & 0 & 0 \\ \frac{3\sqrt{77}}{44} & 0 & 0 & 0 & -\frac{\sqrt{1155}}{308} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x57}}\quad \mathbb{Q}_{6,1}^{(a)}(E_g,1)=\begin{bmatrix} 0 & 0 & 0 & -\frac{3\sqrt{22}}{44} & 0 & 0 & 0 \\ 0 & 0 & -\frac{5\sqrt{22}}{88} & 0 & 0 & 0 & -\frac{\sqrt{330}}{88} \\ 0 & -\frac{5\sqrt{22}}{88} & 0 & 0 & 0 & -\frac{\sqrt{330}}{88} & 0 \\ -\frac{3\sqrt{22}}{44} & 0 & 0 & 0 & -\frac{\sqrt{330}}{44} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{330}}{44} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{330}}{88} & 0 & 0 & 0 & \frac{5\sqrt{22}}{88} \\ 0 & -\frac{\sqrt{330}}{88} & 0 & 0 & 0 & \frac{5\sqrt{22}}{88} & 0 \end{bmatrix}$$

$$\boxed{\text{x58}} \quad \mathbb{Q}_{6,2}^{(a)}(E_g,1) = \begin{bmatrix} 0 & 0 & -\frac{5\sqrt{22}}{88} & 0 & 0 & 0 & \frac{\sqrt{330}}{88} \\ 0 & 0 & 0 & \frac{3\sqrt{22}}{44} & 0 & 0 & 0 \\ -\frac{5\sqrt{22}}{88} & 0 & 0 & 0 & \frac{\sqrt{330}}{88} & 0 & 0 \\ 0 & \frac{3\sqrt{22}}{44} & 0 & 0 & 0 & -\frac{\sqrt{330}}{44} & 0 \\ 0 & 0 & \frac{\sqrt{330}}{88} & 0 & 0 & 0 & \frac{5\sqrt{22}}{88} \\ 0 & 0 & 0 & -\frac{\sqrt{330}}{44} & 0 & 0 & 0 \\ \frac{\sqrt{330}}{88} & 0 & 0 & 0 & \frac{5\sqrt{22}}{88} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x59}} \quad \mathbb{Q}_{6,1}^{(a)}(E_g,2) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}}{16} & 0 & 0 & 0 & \frac{\sqrt{5}}{16} \\ 0 & \frac{\sqrt{3}}{16} & 0 & 0 & 0 & \frac{3\sqrt{5}}{16} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{5}}{16} & 0 & 0 & 0 & \frac{5\sqrt{3}}{16} \\ 0 & \frac{\sqrt{5}}{16} & 0 & 0 & 0 & \frac{5\sqrt{3}}{16} & 0 \end{bmatrix}$$

$$\boxed{\text{x60}} \quad \mathbb{Q}_{6,2}^{(a)}(E_g,2) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{3}}{16} & 0 & 0 & 0 & -\frac{\sqrt{5}}{16} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}}{16} & 0 & 0 & 0 & -\frac{3\sqrt{5}}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{5}}{16} & 0 & 0 & 0 & \frac{5\sqrt{3}}{16} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{5}}{16} & 0 & 0 & 0 & \frac{5\sqrt{3}}{16} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x61}}$ $$\mathbb{Q}_{6,1}^{(a)}(E_g,3) = \begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{165}}{33} & 0 & 0 & 0 \\ 0 & 0 & \frac{17\sqrt{165}}{528} & 0 & 0 & 0 & -\frac{9\sqrt{11}}{176} \\ 0 & \frac{17\sqrt{165}}{528} & 0 & 0 & 0 & -\frac{\sqrt{11}}{16} & 0 \\ \frac{\sqrt{165}}{33} & 0 & 0 & 0 & -\frac{\sqrt{11}}{11} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{11}}{11} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{11}}{16} & 0 & 0 & 0 & \frac{5\sqrt{165}}{528} \\ 0 & -\frac{9\sqrt{11}}{176} & 0 & 0 & 0 & \frac{5\sqrt{165}}{528} & 0 \end{bmatrix}$$

$\boxed{\text{x62}}$ $$\mathbb{Q}_{6,2}^{(a)}(E_g,3) = \begin{bmatrix} 0 & 0 & \frac{17\sqrt{165}}{528} & 0 & 0 & 0 & \frac{9\sqrt{11}}{176} \\ 0 & 0 & 0 & -\frac{\sqrt{165}}{33} & 0 & 0 & 0 \\ \frac{17\sqrt{165}}{528} & 0 & 0 & 0 & \frac{\sqrt{11}}{16} & 0 & 0 \\ 0 & -\frac{\sqrt{165}}{33} & 0 & 0 & 0 & -\frac{\sqrt{11}}{11} & 0 \\ 0 & 0 & \frac{\sqrt{11}}{16} & 0 & 0 & 0 & \frac{5\sqrt{165}}{528} \\ 0 & 0 & 0 & -\frac{\sqrt{11}}{11} & 0 & 0 & 0 \\ \frac{9\sqrt{11}}{176} & 0 & 0 & 0 & \frac{5\sqrt{165}}{528} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x63}}$ $$\mathbb{M}_{5}^{(a)}(A_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & \frac{i}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x64}}\quad \mathbb{M}_1^{(a)}(A_{2g}) = \begin{bmatrix} 0 & -\frac{3\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 \\ \frac{3\sqrt{7}i}{14} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{7}i}{7} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{7}i}{7} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{7}i}{14} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{7}i}{14} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x65}}\quad \mathbb{M}_3^{(a)}(A_{2g}) = \begin{bmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x66}}\quad \mathbb{M}_5^{(a)}(A_{2g},1) = \begin{bmatrix} 0 & -\frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{21}i}{42} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{2\sqrt{21}i}{21} & 0 & 0 & 0 \\ 0 & 0 & -\frac{2\sqrt{21}i}{21} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{5\sqrt{21}i}{42} & 0 \\ 0 & 0 & 0 & 0 & \frac{5\sqrt{21}i}{42} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x67}} \quad \mathbb{M}_5^{(a)}(A_{2g},2) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ \frac{i}{2} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x68}} \quad \mathbb{M}_3^{(a)}(B_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x69}} \quad \mathbb{M}_5^{(a)}(B_{1g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{3} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{3}i}{3} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x70}}$ $$\mathbb{M}_3^{(a)}(B_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x71}}$ $$\mathbb{M}_5^{(a)}(B_{2g}) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{3} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{3} & 0 & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x72}}$ $$\mathbb{M}_{1,1}^{(a)}(E_g) = \begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & 0 & \frac{\sqrt{70}i}{28} & 0 \\ -\frac{\sqrt{42}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{70}i}{28} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{14} \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{14} & 0 \end{bmatrix}$$

$\boxed{\text{x73}}$ $$\mathbb{M}^{(a)}_{1,2}(E_g) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{42}i}{28} & 0 & 0 & 0 \\ \frac{\sqrt{42}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 & 0 \\ 0 & \frac{\sqrt{42}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{70}i}{28} & 0 \\ 0 & 0 & \frac{\sqrt{70}i}{28} & 0 & 0 & 0 & -\frac{\sqrt{42}i}{14} \\ 0 & 0 & 0 & \frac{\sqrt{70}i}{28} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{42}i}{14} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x74}}$ $$\mathbb{M}^{(a)}_{3,1}(E_g,1) = \begin{bmatrix} 0 & 0 & 0 & \frac{i}{4} & 0 & 0 & 0 \\ 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & \frac{\sqrt{15}i}{12} \\ 0 & \frac{i}{4} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 \\ -\frac{i}{4} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{15}i}{12} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{15}i}{12} & 0 & 0 & 0 & \frac{i}{4} \\ 0 & -\frac{\sqrt{15}i}{12} & 0 & 0 & 0 & -\frac{i}{4} & 0 \end{bmatrix}$$

$\boxed{\text{x75}}$ $$\mathbb{M}^{(a)}_{3,2}(E_g,1) = \begin{bmatrix} 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{12} \\ 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 \\ \frac{i}{4} & 0 & 0 & 0 & \frac{\sqrt{15}i}{12} & 0 & 0 \\ 0 & \frac{i}{4} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 & 0 & 0 & \frac{i}{4} \\ 0 & 0 & 0 & \frac{\sqrt{15}i}{12} & 0 & 0 & 0 \\ \frac{\sqrt{15}i}{12} & 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x76}}\quad \mathbb{M}_{3,1}^{(a)}(E_g,2)=\begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{15}i}{12} & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 & 0 & 0 & -\frac{i}{4} \\ 0 & \frac{\sqrt{15}i}{12} & 0 & 0 & 0 & \frac{i}{4} & 0 \\ -\frac{\sqrt{15}i}{12} & 0 & 0 & 0 & \frac{i}{4} & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 \\ 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 & \frac{\sqrt{15}i}{12} \\ 0 & \frac{i}{4} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 \end{bmatrix}$$

$$\boxed{\text{x77}}\quad \mathbb{M}_{3,2}^{(a)}(E_g,2)=\begin{bmatrix} 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 & 0 & 0 & \frac{i}{4} \\ 0 & 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 & 0 & 0 \\ \frac{\sqrt{15}i}{12} & 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 \\ 0 & \frac{\sqrt{15}i}{12} & 0 & 0 & 0 & \frac{i}{4} & 0 \\ 0 & 0 & \frac{i}{4} & 0 & 0 & 0 & \frac{\sqrt{15}i}{12} \\ 0 & 0 & 0 & -\frac{i}{4} & 0 & 0 & 0 \\ -\frac{i}{4} & 0 & 0 & 0 & -\frac{\sqrt{15}i}{12} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x78}}\quad \mathbb{M}_{5,1}^{(a)}(E_g,1)=\begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & 0 \\ 0 & 0 & -\frac{13\sqrt{14}i}{112} & 0 & 0 & 0 & \frac{\sqrt{210}i}{48} \\ 0 & \frac{13\sqrt{14}i}{112} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{336} & 0 \\ \frac{\sqrt{14}i}{14} & 0 & 0 & 0 & \frac{\sqrt{210}i}{42} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{210}i}{42} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{210}i}{336} & 0 & 0 & 0 & -\frac{5\sqrt{14}i}{112} \\ 0 & -\frac{\sqrt{210}i}{48} & 0 & 0 & 0 & \frac{5\sqrt{14}i}{112} & 0 \end{bmatrix}$$

$$\boxed{\text{x79}} \quad \mathbb{M}_{5,2}^{(a)}(E_g, 1) = \begin{bmatrix} 0 & 0 & -\frac{13\sqrt{14}i}{112} & 0 & 0 & 0 & -\frac{\sqrt{210}i}{48} \\ 0 & 0 & 0 & \frac{\sqrt{14}i}{14} & 0 & 0 & 0 \\ \frac{13\sqrt{14}i}{112} & 0 & 0 & 0 & \frac{\sqrt{210}i}{336} & 0 & 0 \\ 0 & -\frac{\sqrt{14}i}{14} & 0 & 0 & 0 & \frac{\sqrt{210}i}{42} & 0 \\ 0 & 0 & -\frac{\sqrt{210}i}{336} & 0 & 0 & 0 & -\frac{5\sqrt{14}i}{112} \\ 0 & 0 & 0 & -\frac{\sqrt{210}i}{42} & 0 & 0 & 0 \\ \frac{\sqrt{210}i}{48} & 0 & 0 & 0 & \frac{5\sqrt{14}i}{112} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x80}} \quad \mathbb{M}_{5,1}^{(a)}(E_g, 2) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{3\sqrt{6}i}{16} \\ 0 & \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & -\frac{3\sqrt{6}i}{16} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{3\sqrt{6}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} \\ 0 & \frac{3\sqrt{6}i}{16} & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 \end{bmatrix}$$

$$\boxed{\text{x81}} \quad \mathbb{M}_{5,2}^{(a)}(E_g, 2) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{3\sqrt{6}i}{16} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{10}i}{16} & 0 & 0 & 0 & \frac{3\sqrt{6}i}{16} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{3\sqrt{6}i}{16} & 0 & 0 & 0 & -\frac{\sqrt{10}i}{16} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -\frac{3\sqrt{6}i}{16} & 0 & 0 & 0 & \frac{\sqrt{10}i}{16} & 0 & 0 \end{bmatrix}$$

$\boxed{\text{x82}}$ $$\mathbb{M}_{5,1}^{(a)}(E_g,3) = \begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{30}i}{12} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} \\ 0 & -\frac{\sqrt{30}i}{24} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 \\ -\frac{\sqrt{30}i}{12} & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{24} \\ 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} & 0 \end{bmatrix}$$

$\boxed{\text{x83}}$ $$\mathbb{M}_{5,2}^{(a)}(E_g,3) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{30}i}{24} & 0 & 0 & 0 & -\frac{\sqrt{2}i}{8} \\ 0 & 0 & 0 & -\frac{\sqrt{30}i}{12} & 0 & 0 & 0 \\ -\frac{\sqrt{30}i}{24} & 0 & 0 & 0 & \frac{\sqrt{2}i}{8} & 0 & 0 \\ 0 & \frac{\sqrt{30}i}{12} & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{8} & 0 & 0 & 0 & -\frac{\sqrt{30}i}{24} \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{8} & 0 & 0 & 0 & \frac{\sqrt{30}i}{24} & 0 & 0 \end{bmatrix}$$

Cluster SAMB

- Site cluster

** Wyckoff: `2b`

$\boxed{\text{y1}}$ $$\mathbb{Q}_0^{(s)}(A_{1g}) = \left[\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right]$$

$\boxed{\text{y2}}$ $$\mathbb{Q}_3^{(s)}(B_{2u}) = \left[\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right]$$

** Wyckoff: `2c`

$\boxed{\text{y3}}$ $$\mathbb{Q}_0^{(s)}(A_{1g}) = \left[\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right]$$

$\boxed{\text{y4}}$ $$\mathbb{Q}_1^{(s)}(A_{2u}) = \left[\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right]$$

** Wyckoff: `2a`

$\boxed{\text{y5}}$ $\mathbb{Q}_{0}^{(s)}(A_{1g}) = \left[\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right]$

$\boxed{\text{y6}}$ $\mathbb{Q}_{3}^{(s)}(B_{2u}) = \left[\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right]$

- Bond cluster

** Wyckoff: `8a@8i`

$\boxed{\text{y7}}$ $\mathbb{Q}_{0}^{(s)}(A_{1g}) = \left[\frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}\right]$

$\boxed{\text{y8}}$ $\mathbb{T}_{0}^{(s)}(A_{1g}) = \left[\frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}\right]$

$\boxed{\text{y9}}$ $\mathbb{Q}_{1}^{(s)}(A_{2u}) = \left[\frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}\right]$

$\boxed{\text{y10}}$ $\mathbb{T}_{1}^{(s)}(A_{2u}) = \left[\frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}\right]$

$\boxed{\text{y11}}$ $\mathbb{Q}_{2}^{(s)}(B_{1g}) = \left[\frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}\right]$

$\boxed{\text{y12}}$ $\mathbb{T}_{2}^{(s)}(B_{1g}) = \left[\frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}\right]$

$\boxed{\text{y13}}$ $\mathbb{M}_{2}^{(s)}(B_{2u}) = \left[\frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, -\frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}, \frac{\sqrt{2}i}{4}\right]$

$\boxed{\text{y14}}$ $\mathbb{Q}_{3}^{(s)}(B_{2u}) = \left[\frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, -\frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}, \frac{\sqrt{2}}{4}\right]$

$\boxed{\text{y15}}$ $\mathbb{Q}_{2,1}^{(s)}(E_{g}) = \left[\frac{1}{2}, -\frac{1}{2}, 0, 0, -\frac{1}{2}, \frac{1}{2}, 0, 0\right]$

$\boxed{\text{y16}}$ $\mathbb{Q}_{2,2}^{(s)}(E_g) = \left[0,\, 0,\, -\frac{1}{2},\, \frac{1}{2},\, 0,\, 0,\, -\frac{1}{2},\, \frac{1}{2}\right]$

$\boxed{\text{y17}}$ $\mathbb{T}_{2,1}^{(s)}(E_g) = \left[\frac{i}{2},\, -\frac{i}{2},\, 0,\, 0,\, -\frac{i}{2},\, \frac{i}{2},\, 0,\, 0\right]$

$\boxed{\text{y18}}$ $\mathbb{T}_{2,2}^{(s)}(E_g) = \left[0,\, 0,\, -\frac{i}{2},\, \frac{i}{2},\, 0,\, 0,\, -\frac{i}{2},\, \frac{i}{2}\right]$

$\boxed{\text{y19}}$ $\mathbb{Q}_{1,1}^{(s)}(E_u) = \left[0,\, 0,\, -\frac{1}{2},\, \frac{1}{2},\, 0,\, 0,\, \frac{1}{2},\, -\frac{1}{2}\right]$

$\boxed{\text{y20}}$ $\mathbb{Q}_{1,2}^{(s)}(E_u) = \left[\frac{1}{2},\, -\frac{1}{2},\, 0,\, 0,\, \frac{1}{2},\, -\frac{1}{2},\, 0,\, 0\right]$

$\boxed{\text{y21}}$ $\mathbb{T}_{1,1}^{(s)}(E_u) = \left[0,\, 0,\, -\frac{i}{2},\, \frac{i}{2},\, 0,\, 0,\, \frac{i}{2},\, -\frac{i}{2}\right]$

$\boxed{\text{y22}}$ $\mathbb{T}_{1,2}^{(s)}(E_u) = \left[\frac{i}{2},\, -\frac{i}{2},\, 0,\, 0,\, \frac{i}{2},\, -\frac{i}{2},\, 0,\, 0\right]$

Site and Bond

Table 5: Orbital of each site

#	site	orbital
1	`Pt1`	$\lvert d_v\rangle$, $\lvert d_{xy}\rangle$, $\lvert d_{xz}\rangle$, $\lvert d_{yz}\rangle$, $\lvert d_u\rangle$
2	`Pt2`	$\lvert d_v\rangle$, $\lvert d_{xy}\rangle$, $\lvert d_{xz}\rangle$, $\lvert d_{yz}\rangle$, $\lvert d_u\rangle$
3	`Si1`	$\lvert p_x\rangle$, $\lvert p_y\rangle$, $\lvert p_z\rangle$
4	`Si2`	$\lvert p_x\rangle$, $\lvert p_y\rangle$, $\lvert p_z\rangle$
5	`U`	$\lvert f_2\rangle$, $\lvert f_1\rangle$, $\lvert f_{bz}\rangle$, $\lvert f_3\rangle$, $\lvert f_{3x}\rangle$, $\lvert f_{3y}\rangle$, $\lvert f_{az}\rangle$

Table 6: Neighbor and bra-ket of each bond

#	head	tail	neighbor	head (bra)	tail (ket)
1	`Pt1`	`Si2`	`[1]`	`[d]`	`[p]`
2	`Pt2`	`Si1`	`[1]`	`[d]`	`[p]`

Site in Unit Cell

Sites in (conventional) cell (no plus set), SL = sublattice

Table 7: '`Pt1`' (#1) site cluster (`2a`), `-4m2`

SL	position ($\boldsymbol{s}$)	mapping
1	`[ 0.75000, 0.25000, 0.00000]`	`[1,2,7,8,11,12,13,14]`
2	`[ 0.25000, 0.75000, 0.00000]`	`[3,4,5,6,9,10,15,16]`

Table 8: '`Pt2`' (#2) site cluster (`2c`), `4mm`

SL	position ($\boldsymbol{s}$)	mapping
1	`[ 0.25000, 0.25000, 0.37850]`	`[1,2,3,4,13,14,15,16]`
2	`[ 0.75000, 0.75000, 0.62150]`	`[5,6,7,8,9,10,11,12]`

Table 9: 'Si1' (#3) site cluster (2b), -4m2

SL	position (s)	mapping
1	[0.75000, 0.25000, 0.50000]	[1,2,7,8,11,12,13,14]
2	[0.25000, 0.75000, 0.50000]	[3,4,5,6,9,10,15,16]

Table 10: 'Si2' (#4) site cluster (2c), 4mm

SL	position (s)	mapping
1	[0.25000, 0.25000, 0.13300]	[1,2,3,4,13,14,15,16]
2	[0.75000, 0.75000, 0.86700]	[5,6,7,8,9,10,11,12]

Table 11: 'U' (#5) site cluster (2c), 4mm

SL	position (s)	mapping
1	[0.25000, 0.25000, 0.74840]	[1,2,3,4,13,14,15,16]
2	[0.75000, 0.75000, 0.25160]	[5,6,7,8,9,10,11,12]

Bond in Unit Cell

Bonds in (conventional) cell (no plus set): tail, head = (SL, plus set), (N)D = (non)directional (listed up to 5th neighbor at most)

Table 12: 1-th 'Pt1'-'Si2' [1] (#1) bond cluster (8a@8i), D, $|\boldsymbol{v}|$= 2.46277 (cartesian)

SL	vector ($\boldsymbol{v}$)	center ($\boldsymbol{c}$)	mapping	head	tail	$\boldsymbol{R}$ (primitive)
1	[0.00000, 0.50000,-0.13300]	[0.25000, 0.50000, 0.06650]	[1,14]	(2,1)	(1,1)	[0,0,0]
2	[0.00000,-0.50000,-0.13300]	[0.25000, 0.00000, 0.06650]	[2,13]	(2,1)	(1,1)	[0,1,0]
3	[-0.50000, 0.00000,-0.13300]	[0.00000, 0.25000, 0.06650]	[3,15]	(1,1)	(1,1)	[1,0,0]
4	[0.50000, 0.00000,-0.13300]	[0.50000, 0.25000, 0.06650]	[4,16]	(1,1)	(1,1)	[0,0,0]
5	[0.00000, 0.50000, 0.13300]	[0.75000, 0.00000, 0.93350]	[5,10]	(1,1)	(2,1)	[0,-1,-1]
6	[0.00000,-0.50000, 0.13300]	[0.75000, 0.50000, 0.93350]	[6,9]	(1,1)	(2,1)	[0,0,-1]
7	[0.50000, 0.00000, 0.13300]	[0.00000, 0.75000, 0.93350]	[7,11]	(2,1)	(2,1)	[-1,0,-1]
8	[-0.50000, 0.00000, 0.13300]	[0.50000, 0.75000, 0.93350]	[8,12]	(2,1)	(2,1)	[0,0,-1]

Table 13: 1-th 'Pt2'-'Si1' [1] (#2) bond cluster (8a@8i), D, $|\boldsymbol{v}|$= 2.40633 (cartesian)

SL	vector ($\boldsymbol{v}$)	center ($\boldsymbol{c}$)	mapping	head	tail	$\boldsymbol{R}$ (primitive)
1	[0.00000, 0.50000,-0.12150]	[0.25000, 0.00000, 0.43925]	[1,14]	(1,1)	(2,1)	[0,-1,0]
2	[0.00000,-0.50000,-0.12150]	[0.25000, 0.50000, 0.43925]	[2,13]	(1,1)	(2,1)	[0,0,0]
3	[-0.50000, 0.00000,-0.12150]	[0.50000, 0.25000, 0.43925]	[3,15]	(1,1)	(1,1)	[0,0,0]
4	[0.50000, 0.00000,-0.12150]	[0.00000, 0.25000, 0.43925]	[4,16]	(1,1)	(1,1)	[-1,0,0]
5	[0.00000, 0.50000, 0.12150]	[0.75000, 0.50000, 0.56075]	[5,10]	(2,1)	(1,1)	[0,0,0]
6	[0.00000,-0.50000, 0.12150]	[0.75000, 0.00000, 0.56075]	[6,9]	(2,1)	(1,1)	[0,1,0]
7	[0.50000, 0.00000, 0.12150]	[0.50000, 0.75000, 0.56075]	[7,11]	(2,1)	(2,1)	[0,0,0]

continued ...

Table 13

SL	vector ($\boldsymbol{v}$)	center ($\boldsymbol{c}$)	mapping	head	tail	$\boldsymbol{R}$ (primitive)
8	[-0.50000, 0.00000, 0.12150]	[0.00000, 0.75000, 0.56075]	[8,12]	(2,1)	(2,1)	[1,0,0]