Appendix B

Coefficients $\mathcal{A}_j^{(i)}$ and $\mathcal{B}_j^{(i)}$

The coefficients $\mathcal{A}_j^{(i)}$ and $\mathcal{B}_j^{(i)}$, introduced in equations (11.4.4) and (11.4.5), are

$$\mathcal{A}_1^{(1)}(m,n) = -\frac{8}{9}mn^2 A_{0,0}B_{0,0},$$

$$\mathcal{A}_2^{(1)}(m,n) = \frac{8}{9}n^2 A_{0,0}B_{0,0},$$

$$\mathcal{A}_3^{(1)}(m,n) = \frac{8}{9}mA_{0,0}B_{0,0},$$

$$\begin{aligned}\mathcal{A}_1^{(2)}(m,n) = \frac{4}{9}n\big(&4mnA_{0,0}B_{0,0}H_m + 6mnA_{0,0}B_{0,0}H_n - 4mnA_{0,1}B_{0,0}\\ &- 3mnA_{0,0}B_{0,1} - 4mnA_{0,0}B_{0,0}\psi^{(0)}(m+n+1)\\ &- 4mA_{0,0}B_{0,0} - 2nA_{0,0}B_{0,0}\big),\end{aligned}$$

$$\begin{aligned}\mathcal{A}_2^{(2)}(m,n) = -\frac{4}{9}n\big(&4nA_{0,0}B_{0,0}H_m + 6nA_{0,0}B_{0,0}H_n\\ &- 4nA_{0,0}B_{0,0}\psi^{(0)}(m+n+1) - 4nA_{0,1}B_{0,0}\\ &- 3nA_{0,0}B_{0,1} - 4A_{0,0}B_{0,0}\big),\end{aligned}$$

$$\begin{aligned}\mathcal{A}_3^{(2)}(m,n) = -\frac{4}{9}\big(&6mA_{0,0}B_{0,0}H_n + 4mA_{0,0}B_{0,0}H_m\\ &- 4mA_{0,0}B_{0,0}\psi^{(0)}(m+n+1) - 4mA_{0,1}B_{0,0}\\ &- 3mA_{0,0}B_{0,1} - 2A_{0,0}B_{0,0}\big),\end{aligned}$$

$$\begin{aligned}\mathcal{A}_1^{(3)}(m,n) = -\frac{2}{9}\big(&24mn^2A_{0,0}B_{0,0}H_mH_n - 24mn^2A_{0,1}B_{0,0}H_n\\ &- 12mn^2A_{0,0}B_{0,1}H_m - 8mn^2A_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)\\ &- 18mn^2A_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1) - 16mnA_{0,0}B_{0,0}H_m\\ &- 12mnA_{0,0}B_{0,0}H_n - 12n^2A_{0,0}B_{0,0}H_n + 12mn^2A_{0,1}B_{0,1}\\ &+ 9mn^2A_{0,0}B_{n,2} + 5mn^2A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^2\\ &+ 4n^2A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)\\ &+ 5mn^2A_{0,0}B_{0,0}\psi^{(1)}(m+n+1)\\ &+ 8mn^2A_{0,1}B_{0,0}\psi^{(0)}(m+n+1)\\ &+ 9mn^2A_{0,0}B_{0,1}\psi^{(0)}(m+n+1)\\ &+ 16mnA_{0,1}B_{0,0} + 6mnA_{0,0}B_{0,1}\\ &+ 12mnA_{0,0}B_{0,0}\psi^{(0)}(m+n+1)\\ &+ 2mA_{0,0}B_{0,0} + 6n^2A_{0,0}B_{0,1} + 8nA_{0,0}B_{0,0}\big),\end{aligned}$$

$$
\begin{aligned}
\mathcal{A}_2^{(3)}(m,n) = \frac{2}{9}\big(&24n^2A_{0,0}B_{0,0}H_mH_n - 12n^2A_{0,0}B_{0,1}H_m\\
&- 8n^2A_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)\\
&- 18n^2A_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1)\\
&- 16nA_{0,0}B_{0,0}H_m - 24n^2A_{0,1}B_{0,0}H_n - 12nA_{0,0}B_{0,0}H_n\\
&+ 5n^2A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^2\\
&+ 5n^2A_{0,0}B_{0,0}\psi^{(1)}(m+n+1)\\
&+ 8n^2A_{0,1}B_{0,0}\psi^{(0)}(m+n+1)\\
&+ 9n^2A_{0,0}B_{0,1}\psi^{(0)}(m+n+1)\\
&+ 12nA_{0,0}B_{0,0}\psi^{(0)}(m+n+1)\\
&+ 12n^2A_{0,1}B_{0,1} + 9n^2A_{0,0}B_{n,2}\\
&+ 16nA_{0,1}B_{0,0} + 6nA_{0,0}B_{0,1} + 2A_{0,0}B_{0,0}\big),\\
\mathcal{A}_3^{(3)}(m,n) = \frac{2}{9}\big(&24mA_{0,0}B_{0,0}H_mH_n - 24mA_{0,1}B_{0,0}H_n\\
&- 8mA_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)\\
&- 18mA_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1)\\
&- 12mA_{0,0}B_{0,1}H_m - 12A_{0,0}B_{0,0}H_n + 9mA_{0,0}B_{n,2}\\
&+ 5mA_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^2 + 4A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)\\
&+ 8mA_{0,1}B_{0,0}\psi^{(0)}(m+n+1) + 9mA_{0,0}B_{0,1}\psi^{(0)}(m+n+1)\\
&+ 5mA_{0,0}B_{0,0}\psi^{(1)}(m+n+1) + 12mA_{0,1}B_{0,1} + 6A_{0,0}B_{0,1}\big),\\
\mathcal{A}_1^{(4)}(m,n) = -\frac{2}{9}\big(&-18mn^2A_{0,0}H_mB_{n,2} - 2mn^2A_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)^2\\
&- 6mn^2A_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1)^2\\
&- 6n^2A_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1)\\
&+ 12mn^2A_{0,0}B_{0,0}H_mH_n\psi^{(0)}(m+n+1)\\
&- 12mn^2A_{0,1}B_{0,0}H_n\psi^{(0)}(m+n+1)\\
&- 6mn^2A_{0,0}B_{0,1}H_m\psi^{(0)}(m+n+1)\\
&- 2mn^2A_{0,0}B_{0,0}H_m\psi^{(1)}(m+n+1)\\
&- 6mn^2A_{0,0}B_{0,0}H_n\psi^{(1)}(m+n+1)\\
&+ 24mnA_{0,0}B_{0,0}H_mH_n - 24mnA_{0,1}B_{0,0}H_n\\
&- 12mnA_{0,0}B_{0,1}H_m - 8mnA_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)\\
&- 12mnA_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1) - 4mA_{0,0}B_{0,0}H_m\\
&- 12nA_{0,0}B_{0,0}H_n + 18mn^2A_{0,1}B_{n,2}\\
&+ mn^2A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^3
\end{aligned}
$$

$$
\begin{aligned}
&+ n^2 A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&+ 2mn^2 A_{0,1} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&+ 3mn^2 A_{0,0} B_{0,1} \psi^{(0)}(m+n+1)^2 \\
&+ 3mn^2 A_{0,0} B_{0,0} \psi^{(1)}(m+n+1)\psi^{(0)}(m+n+1) \\
&+ 3n^2 A_{0,0} B_{0,1} \psi^{(0)}(m+n+1) \\
&+ 6mn^2 A_{0,1} B_{0,1} \psi^{(0)}(m+n+1) \\
&+ 9mn^2 A_{0,0} B_{n,2} \psi^{(0)}(m+n+1) \\
&+ n^2 A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) \\
&+ mn^2 A_{0,0} B_{0,0} \psi^{(2)}(m+n+1) \\
&+ 2mn^2 A_{0,1} B_{0,0} \psi^{(1)}(m+n+1) \\
&+ 3mn^2 A_{0,0} B_{0,1} \psi^{(1)}(m+n+1) + 12mn A_{0,1} B_{0,1} \\
&+ 4mn A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&+ 2m A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 4n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 8mn A_{0,1} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 6mn A_{0,0} B_{0,1} \psi^{(0)}(m+n+1) \\
&+ 4mn A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) \\
&+ 4m A_{0,1} B_{0,0} + 9n^2 A_{0,0} B_{n,2} + 6n A_{0,0} B_{0,1} + 2A_{0,0} B_{0,0}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{A}_2^{(4)}(m,n) = \frac{2}{9}\big(&-18n^2 A_{0,0} H_m B_{n,2} - 2n^2 A_{0,0} B_{0,0} H_m \psi^{(0)}(m+n+1)^2 \\
&- 6n^2 A_{0,0} B_{0,0} H_n \psi^{(0)}(m+n+1)^2 \\
&+ 12n^2 A_{0,0} B_{0,0} H_m H_n \psi^{(0)}(m+n+1) \\
&- 12n^2 A_{0,1} B_{0,0} H_n \psi^{(0)}(m+n+1) \\
&- 6n^2 A_{0,0} B_{0,1} H_m \psi^{(0)}(m+n+1) \\
&- 2n^2 A_{0,0} B_{0,0} H_m \psi^{(1)}(m+n+1) \\
&- 6n^2 A_{0,0} B_{0,0} H_n \psi^{(1)}(m+n+1) \\
&+ 24n A_{0,0} B_{0,0} H_m H_n - 12n A_{0,0} B_{0,1} H_m \\
&- 8n A_{0,0} B_{0,0} H_m \psi^{(0)}(m+n+1) \\
&- 12n A_{0,0} B_{0,0} H_n \psi^{(0)}(m+n+1) \\
&- 4A_{0,0} B_{0,0} H_m - 24n A_{0,1} B_{0,0} H_n \\
&+ n^2 A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^3 \\
&+ 2n^2 A_{0,1} B_{0,0} \psi^{(0)}(m+n+1)^2
\end{aligned}
$$

$$
\begin{aligned}
&+ 3n^2 A_{0,0} B_{0,1} \psi^{(0)}(m+n+1)^2 \\
&+ 3n^2 A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) \psi^{(0)}(m+n+1) \\
&+ 6n^2 A_{0,1} B_{0,1} \psi^{(0)}(m+n+1) \\
&+ 9n^2 A_{0,0} B_{n,2} \psi^{(0)}(m+n+1) \\
&+ n^2 A_{0,0} B_{0,0} \psi^{(2)}(m+n+1) + 2n^2 A_{0,1} B_{0,0} \psi^{(1)}(m+n+1) \\
&+ 3n^2 A_{0,0} B_{0,1} \psi^{(1)}(m+n+1) \\
&+ 4n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 + 2A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 8n A_{0,1} B_{0,0} \psi^{(0)}(m+n+1) + 6n A_{0,0} B_{0,1} \psi^{(0)}(m+n+1) \\
&+ 4n A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) + 18n^2 A_{0,1} B_{n,2} \\
&+ 12n A_{0,1} B_{0,1} + 4A_{0,1} B_{0,0}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{A}_3^{(4)}(m,n) = -\frac{2}{9}\big(&18m A_{0,0} H_m B_{n,2} + 2m A_{0,0} B_{0,0} H_m \psi^{(0)}(m+n+1)^2 \\
&+ 6m A_{0,0} B_{0,0} H_n \psi^{(0)}(m+n+1)^2 \\
&- 12m A_{0,0} B_{0,0} H_m H_n \psi^{(0)}(m+n+1) \\
&+ 6A_{0,0} B_{0,0} H_n \psi^{(0)}(m+n+1) \\
&+ 12m A_{0,1} B_{0,0} H_n \psi^{(0)}(m+n+1) \\
&+ 6m A_{0,0} B_{0,1} H_m \psi^{(0)}(m+n+1) \\
&+ 2m A_{0,0} B_{0,0} H_m \psi^{(1)}(m+n+1) \\
&+ 6m A_{0,0} B_{0,0} H_n \psi^{(1)}(m+n+1) \\
&- 18m A_{0,1} B_{n,2} - m A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^3 \\
&- A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 - 2m A_{0,1} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&- 3m A_{0,0} B_{0,1} \psi^{(0)}(m+n+1)^2 \\
&- 3m A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) \psi^{(0)}(m+n+1) \\
&- 3A_{0,0} B_{0,1} \psi^{(0)}(m+n+1) - 6m A_{0,1} B_{0,1} \psi^{(0)}(m+n+1) \\
&- 9m A_{0,0} B_{n,2} \psi^{(0)}(m+n+1) - A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) \\
&- m A_{0,0} B_{0,0} \psi^{(2)}(m+n+1) - 2m A_{0,1} B_{0,0} \psi^{(1)}(m+n+1) \\
&- 3m A_{0,0} B_{0,1} \psi^{(1)}(m+n+1) - 9A_{0,0} B_{n,2}\big),
\end{aligned}
$$

$$
\mathcal{B}_1^{(1)}(m,n) = \frac{2}{9} n A_{0,0} B_{0,0}(m-n),
$$

$$
\mathcal{B}_2^{(1)}(m,n) = -\frac{2}{9} n A_{0,0} B_{0,0},
$$

$$
\mathcal{B}_3^{(1)}(m,n) = \frac{2}{9} A_{0,0} B_{0,0},
$$

$$
\begin{aligned}
\mathcal{B}_1^{(2)}(m,n) = -\frac{1}{9}(m-n)\big(&4nA_{0,0}B_{0,0}H_m + 6nA_{0,0}B_{0,0}H_n \\
&- 4nA_{0,0}B_{0,0}\psi^{(0)}(m+n+1) - 4nA_{0,1}B_{0,0} \\
&- 3nA_{0,0}B_{0,1} - 2A_{0,0}B_{0,0}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_2^{(2)}(m,n) = \frac{1}{9}\big(&4nA_{0,0}B_{0,0}H_m + 6nA_{0,0}B_{0,0}H_n \\
&- 4nA_{0,0}B_{0,0}\psi^{(0)}(m+n+1) - 4nA_{0,1}B_{0,0} \\
&- 3nA_{0,0}B_{0,1} - 2A_{0,0}B_{0,0}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_3^{(2)}(m,n) = \frac{1}{9}\big(&-4A_{0,0}B_{0,0}H_m - 6A_{0,0}B_{0,0}H_n \\
&+ 4A_{0,0}B_{0,0}\psi^{(0)}(m+n+1) + 4A_{0,1}B_{0,0} + 3A_{0,0}B_{0,1}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_1^{(3)}(m,n) = \frac{1}{18}\big(&-24n^2A_{0,0}B_{0,0}H_mH_n + 12n^2A_{0,0}B_{0,1}H_m \\
&+ 8n^2A_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1) \\
&+ 18n^2A_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1) + 16nA_{0,0}B_{0,0}H_m \\
&+ 24mnA_{0,0}B_{0,0}H_mH_n - 24mnA_{0,1}B_{0,0}H_n \\
&- 12mnA_{0,0}B_{0,1}H_m - 6mA_{0,0}B_{0,0}H_n \\
&- 8mnA_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1) \\
&- 18mnA_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1) \\
&- 8mA_{0,0}B_{0,0}H_m + 24n^2A_{0,1}B_{0,0}H_n \\
&- 5n^2A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^2 \\
&- 5n^2A_{0,0}B_{0,0}\psi^{(1)}(m+n+1) \\
&- 8n^2A_{0,1}B_{0,0}\psi^{(0)}(m+n+1) \\
&- 9n^2A_{0,0}B_{0,1}\psi^{(0)}(m+n+1) \\
&+ 12mnA_{0,1}B_{0,1} + 9mnA_{0,0}B_{n,2} \\
&+ 5mnA_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^2 \\
&- 8nA_{0,0}B_{0,0}\psi^{(0)}(m+n+1) \\
&+ 5mnA_{0,0}B_{0,0}\psi^{(1)}(m+n+1) \\
&+ 8mnA_{0,1}B_{0,0}\psi^{(0)}(m+n+1) \\
&+ 9mnA_{0,0}B_{0,1}\psi^{(0)}(m+n+1) \\
&+ 6mA_{0,0}B_{0,0}\psi^{(0)}(m+n+1) + 8mA_{0,1}B_{0,0} + 3mA_{0,0}B_{0,1} \\
&- 12n^2A_{0,1}B_{0,1} - 9n^2A_{0,0}B_{n,2} - 16nA_{0,1}B_{0,0} + 2A_{0,0}B_{0,0}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_2^{(3)}(m,n) = \frac{1}{18}\big(&-24nA_{0,0}B_{0,0}H_mH_n + 12nA_{0,0}B_{0,1}H_m \\
&+ 8nA_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)
\end{aligned}
$$

$$
\begin{aligned}
&+ 18n A_{0,0} B_{0,0} H_n \psi^{(0)}(m+n+1) \\
&+ 8A_{0,0} B_{0,0} H_m + 6A_{0,0} B_{0,0} H_n + 24n A_{0,1} B_{0,0} H_n \\
&- 5n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 - 6A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&- 8n A_{0,1} B_{0,0} \psi^{(0)}(m+n+1) - 9n A_{0,0} B_{0,1} \psi^{(0)}(m+n+1) \\
&- 5n A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) - 12n A_{0,1} B_{0,1} - 9n A_{0,0} B_{n,2} \\
&- 8A_{0,1} B_{0,0} - 3A_{0,0} B_{0,1}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_3^{(3)}(m,n) = \frac{1}{18}\big(&24 A_{0,0} B_{0,0} H_m H_n - 8A_{0,0} B_{0,0} H_m \psi^{(0)}(m+n+1) \\
&- 18A_{0,0} B_{0,0} H_n \psi^{(0)}(m+n+1) - 12A_{0,0} B_{0,1} H_m \\
&- 24A_{0,1} B_{0,0} H_n + 5A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&+ 8A_{0,1} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 9A_{0,0} B_{0,1} \psi^{(0)}(m+n+1) + 5A_{0,0} B_{0,0} \psi^{(1)}(m+n+1) \\
&+ 9A_{0,0} B_{n,2} + 12A_{0,1} B_{0,1}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_1^{(4)}(m,n) = \frac{1}{18}\big(&-n^2 A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^3 \\
&+ mn A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^3 \\
&+ 2m A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&- 3n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&+ 2n^2 H_m A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&- 2mn H_m A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&+ 6n^2 H_n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&- 6mn H_n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&- 2n^2 A_{0,1} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&+ 2mn A_{0,1} B_{0,0} \psi^{(0)}(m+n+1)^2 \\
&- 3n^2 A_{0,0} B_{0,1} \psi^{(0)}(m+n+1)^2 \\
&+ 3mn A_{0,0} B_{0,1} \psi^{(0)}(m+n+1)^2 \\
&- 4m H_m A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 8n H_m A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&- 6m H_n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 6n H_n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&- 12n^2 H_m H_n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1) \\
&+ 12mn H_m H_n A_{0,0} B_{0,0} \psi^{(0)}(m+n+1)
\end{aligned}
$$

$$
\begin{aligned}
&- 3n^2\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)\\
&+ 3mn\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)\\
&+ 4mA_{0,1}B_{0,0}\psi^{(0)}(m+n+1) - 8nA_{0,1}B_{0,0}\psi^{(0)}(m+n+1)\\
&+ 12n^2H_nA_{0,1}B_{0,0}\psi^{(0)}(m+n+1)\\
&- 12mnH_nA_{0,1}B_{0,0}\psi^{(0)}(m+n+1)\\
&+ 3mA_{0,0}B_{0,1}\psi^{(0)}(m+n+1) - 3nA_{0,0}B_{0,1}\psi^{(0)}(m+n+1)\\
&+ 6n^2H_mA_{0,0}B_{0,1}\psi^{(0)}(m+n+1)\\
&- 6mnH_mA_{0,0}B_{0,1}\psi^{(0)}(m+n+1)\\
&- 6n^2A_{0,1}B_{0,1}\psi^{(0)}(m+n+1)\\
&+ 6mnA_{0,1}B_{0,1}\psi^{(0)}(m+n+1)\\
&- 9n^2A_{0,0}B_{n,2}\psi^{(0)}(m+n+1)\\
&+ 9mnA_{0,0}B_{n,2}\psi^{(0)}(m+n+1)\\
&+ 4H_mA_{0,0}B_{0,0} + 12mH_mH_nA_{0,0}B_{0,0} - 24nH_mH_nA_{0,0}B_{0,0}\\
&- 6H_nA_{0,0}B_{0,0} + 2m\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\\
&- 3n\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\\
&+ 2n^2H_m\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\\
&- 2mnH_m\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\\
&+ 6n^2H_n\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\\
&- 6mnH_n\psi^{(1)}(m+n+1)A_{0,0}B_{0,0}\\
&- n^2\psi^{(2)}(m+n+1)A_{0,0}B_{0,0} + mn\psi^{(2)}(m+n+1)A_{0,0}B_{0,0}\\
&- 12mH_nA_{0,1}B_{0,0} + 24nH_nA_{0,1}B_{0,0}\\
&- 2n^2\psi^{(1)}(m+n+1)A_{0,1}B_{0,0}\\
&+ 2mn\psi^{(1)}(m+n+1)A_{0,1}B_{0,0}\\
&- 4A_{0,1}B_{0,0} - 6mH_mA_{0,0}B_{0,1}\\
&+ 12nH_mA_{0,0}B_{0,1} - 3n^2\psi^{(1)}(m+n+1)A_{0,0}B_{0,1}\\
&+ 3mn\psi^{(1)}(m+n+1)A_{0,0}B_{0,1} + 3A_{0,0}B_{0,1} + 6mA_{0,1}B_{0,1}\\
&- 12nA_{0,1}B_{0,1} + 9nA_{0,0}B_{n,2} + 18n^2H_mA_{0,0}B_{n,2}\\
&- 18mnH_mA_{0,0}B_{n,2} - 18n^2A_{0,1}B_{n,2} + 18mnA_{0,1}B_{n,2}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_2^{(4)}(m,n) = \frac{1}{18}\big(&-12A_{0,0}B_{0,0}H_mH_n + 18nA_{0,0}H_mB_{n,2}\\
&+ 2nA_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)^2\\
&+ 6nA_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1)^2
\end{aligned}
$$

$$
\begin{aligned}
&+ 4A_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)\\
&- 12nA_{0,0}B_{0,0}H_mH_n\psi^{(0)}(m+n+1)\\
&+ 6A_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1)\\
&+ 12nA_{0,1}B_{0,0}H_n\psi^{(0)}(m+n+1)\\
&+ 6nA_{0,0}B_{0,1}H_m\psi^{(0)}(m+n+1)\\
&+ 2nA_{0,0}B_{0,0}H_m\psi^{(1)}(m+n+1)\\
&+ 6nA_{0,0}B_{0,0}H_n\psi^{(1)}(m+n+1)\\
&+ 6A_{0,0}B_{0,1}H_m + 12A_{0,1}B_{0,0}H_n\\
&- nA_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^3\\
&- 2A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^2 - 2nA_{0,1}B_{0,0}\psi^{(0)}(m+n+1)^2\\
&- 3nA_{0,0}B_{0,1}\psi^{(0)}(m+n+1)^2\\
&- 3nA_{0,0}B_{0,0}\psi^{(1)}(m+n+1)\psi^{(0)}(m+n+1)\\
&- 4A_{0,1}B_{0,0}\psi^{(0)}(m+n+1) - 3A_{0,0}B_{0,1}\psi^{(0)}(m+n+1)\\
&- 6nA_{0,1}B_{0,1}\psi^{(0)}(m+n+1) - 9nA_{0,0}B_{n,2}\psi^{(0)}(m+n+1)\\
&- 2A_{0,0}B_{0,0}\psi^{(1)}(m+n+1) - nA_{0,0}B_{0,0}\psi^{(2)}(m+n+1)\\
&- 2nA_{0,1}B_{0,0}\psi^{(1)}(m+n+1) - 3nA_{0,0}B_{0,1}\psi^{(1)}(m+n+1)\\
&- 18nA_{0,1}B_{n,2} - 6A_{0,1}B_{0,1}\big),
\end{aligned}
$$

$$
\begin{aligned}
\mathcal{B}_3^{(4)}(m,n) = \frac{1}{18}\big(&-18A_{0,0}H_mB_{n,2} - 2A_{0,0}B_{0,0}H_m\psi^{(0)}(m+n+1)^2\\
&- 6A_{0,0}B_{0,0}H_n\psi^{(0)}(m+n+1)^2\\
&+ 12A_{0,0}B_{0,0}H_mH_n\psi^{(0)}(m+n+1)\\
&- 12A_{0,1}B_{0,0}H_n\psi^{(0)}(m+n+1)\\
&- 6A_{0,0}B_{0,1}H_m\psi^{(0)}(m+n+1)\\
&- 2A_{0,0}B_{0,0}H_m\psi^{(1)}(m+n+1)\\
&- 6A_{0,0}B_{0,0}H_n\psi^{(1)}(m+n+1) + A_{0,0}B_{0,0}\psi^{(0)}(m+n+1)^3\\
&+ 2A_{0,1}B_{0,0}\psi^{(0)}(m+n+1)^2 + 3A_{0,0}B_{0,1}\psi^{(0)}(m+n+1)^2\\
&+ 3A_{0,0}B_{0,0}\psi^{(1)}(m+n+1)\psi^{(0)}(m+n+1)\\
&+ 6A_{0,1}B_{0,1}\psi^{(0)}(m+n+1)\\
&+ 9A_{0,0}B_{n,2}\psi^{(0)}(m+n+1) + A_{0,0}B_{0,0}\psi^{(2)}(m+n+1)\\
&+ 2A_{0,1}B_{0,0}\psi^{(1)}(m+n+1) + 3A_{0,0}B_{0,1}\psi^{(1)}(m+n+1)\\
&+ 18A_{0,1}B_{n,2}\big).
\end{aligned}
$$