$$\left\{ B_1[1, 1] == -\frac{1}{32} - \frac{\epsilon}{32} + \left(-\frac{1}{32} - \frac{\pi^2}{96}\right) \epsilon^2, \right.$$

$$\left. B_2[1, 1] == -\frac{1}{16} \epsilon \, \text{Log}[2] + \epsilon^2 \left(-\frac{\pi^2}{192} + \frac{\text{Log}[2]^2}{8}\right) \right\}$$