Hence we see that P_1 and P_4 are weakly rooted bisimilar and P_2 and P_5 are weakly rooted bisimilar.

(d) P_1 and P_2 are not rooted branching bisimilar since the root of P_1 needs to be related to a non-root state of P_2, but this is disallowed by the root condition.

P_1 and P_3 are not branching bisimilar and hence cannot be rooted branching bisimilar. For this very reason, P_3 cannot be rooted branching bisimilar to any other process.

P_1 and P_4 are rooted branching bisimilar by the same witness presented in part (a). P_4 cannot be rooted branching bisimilar to P_2

P_1 and P_5 are not rooted branching bisimilar as any witness wouldd violate the root condition. P_5 cannot be rooted branching bisimilar to P_4.

P_2 and P_5 are not rooted branching bisimilar as any witness would violate the root condition as seen in part (b).

Hence, we have that $P_1 =_{RBB} P_4$.

2.

$$
\begin{aligned}
&\alpha.(\tau(P+Q)+Q)\\
=&\alpha.((\tau(P+Q)+(P+Q))+Q)\\
=&\alpha.(((\tau(P+Q)+P)+Q)+Q)\\
=&\alpha.((\tau(P+Q)+P)+(Q+Q))\\
=&\alpha.((\tau(P+Q)+P)+Q)\\
=&\alpha.(\tau(P+Q)+(P+Q))\\
=&\alpha.(\tau(P+Q))\\
=&\alpha.(P+Q)
\end{aligned}
$$

Hence we have shown that $\alpha.(\tau(P+Q)+Q) = \alpha.(P+Q)$, which is the axion B.