1. Give the LTS of the following behavior expressions:
   
   a) \( a; \text{stop} \) \( [> a; \text{stop} \)
   
   b) \( (a; \text{exit} >> b; \text{exit}) \) \( [> c; \text{exit} \)
   
   c) \( (a; \text{exit} [> i; \text{stop}) >> c; \text{stop} \)
   
   d) \( \text{hide b in} (a; \text{exit} [> b; \text{stop}) \mid (b) \mid c; \text{b; exit} \)
   
   e) \( (a; \text{exit} \mid (b; \text{stop} [> \text{exit})) >> c; \text{stop} \)
   
   f) \( a; b; \text{exit} \mid (a, c) \mid (a; c; \text{exit [> d; exit}) \)
   
   g) \( (a; \text{exit} [> b; \text{stop}) \mid (b) \mid (\text{hide b in} (c; \text{exit [> b; stop} \) \)
   
   h) \( (P[a, b]) \mid (P[b, a]) \)
   
   where
   
   \[
   \text{process } P[c, d]: \text{exit} :=
   \]
   
   \[
   \text{hide e in}
   \]
   
   \[
   (e; c; \text{exit [} d; \text{exit})
   \]
   
   endproc

2. Among identity (=), strong bisimulation (\(~\)) and weak bisimulation (\(\approx\)), which relations hold for each of the following pairs of behavior expressions (remember that = \(\Rightarrow\) ~ \(\Rightarrow\) \(\approx\))? If none apply, give a counter-example for \(\approx\).
   
   a) \( (B \mid \mid \text{stop}) \) and \( \text{stop} \)
   
   b) \( (B [> \text{stop}) \) and \( \text{stop} \)
   
   c) \( \text{stop} \) [> \( B \)] and \( \text{stop} \)
   
   d) \( (B \mid \mid \text{stop}) \) and \( B \)
   
   e) \( (B >> \text{stop}) \) and \( (B \parallel \text{stop}) \)

3. Give the behavior expression of a system that generates all possible finite traces consisting of a certain number of a’s, immediately followed by an equal number of b’s, etc. For example, aabbaaabbab
   
   is a possible trace of such a system. Carefully explain how your specification works (note: if your specification is not quite short, you must be doing something wrong). It is by constructing specifications like these that one can prove that Basic LOTOS has the power of a Turing machine, i.e. any conceivable computation can be specified in Basic LOTOS!

4. Five (5) processes, \(P, Q, R, S\) and \(T\), have particular synchronization needs, as illustrated by the figure below. Write a behavior expression, using different parallel composition operators, that implements these architectural requirements.