CSI 5109 - Assignment 2

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

2. Among identity (=), strong bisimulation (~) and weak bisimulation (≈), which relations hold for each of the following pairs of behavior expressions (remember that = ⇒ ~ ⇒ ≈)? If none apply, give a counter-example for ≈.
   a) `(B || stop)` and `stop`
   b) `(B [> stop)` and `stop`
   c) `(stop [> B)` and `stop`
   d) `(B ||| stop)` and `B`
   e) `(B >> stop)` and `(B ||| 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,

   aabbaaaabbbbab

   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.