Consider the following two net systems, which do not belong to the class of sound, block-structured WF-systems.

Can the behaviour described by the systems in terms of completed trace semantics be specified in a Process Tree? Discuss the different options for answering this question w.r.t. the following properties of a potential solution:

1. The Process Tree is built solely based on the operators introduced in the lecture and has uniquely labelled leaf-nodes.
2. The Process Tree is built solely based on the operators introduced in the lecture.
3. The Process Tree is built of an extended set of operators (define syntax and semantics of any additional operator used) and has uniquely labelled leaf-nodes.
4. The Process Tree may be imprecise, i.e., the set of completed traces of the net system is only a subset of the completed traces described by the Process Tree.
**TASK 6.2**

Consider an event log containing the following traces:
L = {ACDEGJ, DAECGHIFJ, CBEDFHIGJ, BDCEFJ, CADEGJ, DBCEFHIGJ, AEDCFJ, BECDGHIGJ}

1. Create the graph induced by the direct successor relation (including a dedicated start node and a dedicated end node).
2. Apply the algorithm of the Inductive Miner, i.e., find the respective graph cuts recursively and synthesise the Process Tree structure.
   
   **Hints for finding the cuts:**
   - Find the strongly connected components (SCCs) of the graph, i.e., maximal partitions of nodes in which each node is reachable from each other node. Iteratively identify cuts for the SCCs.
   - SCCs that are unconnected hint at exclusive choice cuts.
   - The structure derived when collapsing SCCs and pairwise unconnected nodes hints at a sequence cut.
   - If the above cuts cannot be found, invert the graph by removing bidirectional connections between two nodes (nodes that are connected in both directions), and by adding bidirectional edges between all other pairs of nodes (that have not been connected by edges in either direction). SCCs of the resulting graph hint at parallel cuts.
   - If no parallel cuts can be found for the inversed graph, the start (incoming edges from the original graph) and end nodes (outgoing edges to original graph) may be removed before computing SCCs. This way, loop cuts may be identified.

3. Discuss the implications of having an additional trace CDABEGJ in the event log. How would that change the result obtained by the Inductive Miner?
4. Discuss how the repetition of an activity execution (as in trace ACCCCDEGJ) can be treated in the discovery procedure of the Inductive Miner.

**TASK 6.3**

Consider the following WF-net system and event log (containing the traces and their frequencies).

1. Is the WF-net system sound?
2. For each trace, compute the fitness with the given WF-net system.
3. Compute the overall fitness of the event log with the given WF-net system.