**6SENG002W Concurrent Programming**

**FSP Process Analysis & Design Form**

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**1. FSP Process Attributes**

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| **Attribute** | **Value** |
| **Name** | PRINTER |
| **Description** | A printing machine which can be used to print documents. |
| **Alphabet** | { acquire, empty, print[1], print[2], print[3], release } |
| **Number of States** | 17 |
| **Deadlocks (yes/no)** | No deadlocks/errors |
| **Deadlock Trace(s)** | None |

**2. FSP Process Code**

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| **FSP Process:** |
| const MIN\_SHEET\_COUNT = 1  const MAX\_SHEET\_COUNT = 3  range DOC\_COUNT = MIN\_SHEET\_COUNT .. MAX\_SHEET\_COUNT  range SHEET\_STACK = 0 .. MAX\_SHEET\_COUNT  PRINTER(SHEETS\_AVAILABLE = MAX\_SHEET\_COUNT) = PRINTER\_AVAILABLE[MAX\_SHEET\_COUNT],  PRINTER\_AVAILABLE[sheets\_available: SHEET\_STACK] =  (  when(sheets\_available == 0)empty -> release -> PRINTER\_AVAILABLE[MAX\_SHEET\_COUNT] |  when(sheets\_available > 0)acquire -> print[DOC\_COUNT] -> release -> PRINTER\_AVAILABLE[sheets\_available - 1]  ). |

**3. Actions Description**

A description of what each of the FSP process' actions represents, i.e. is modelling. In addition, indicate if the action is intended to be synchronised (shared) with another process or asynchronous (not shared). (Add rows as necessary.)

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| **Actions** | **Represents** | **Synchronous or Asynchronous** |
| acquire | Acquiring the printer by a student to print a document or to by a technician to refill the printer | Asynchronous |
| print[1] | Printing a document which has ID = 1 | Asynchronous |
| print[2] | Printing a document which has ID = 2 | Asynchronous |
| print[3] | Printing a document which has ID = 3 | Asynchronous |
| empty | Notifying the technician that the printer ran out of documents | Asynchronous |
| release | Releasing the printer by a student after printing a document or by a technician after refilling the printer | Asynchronous |

**4. FSM/LTS Diagrams of FSP Process**

Note that if there are too many states, more than 64, then the LTSA tool will not be able to draw the diagram. In this case draw small diagrams of the most important parts of the complete diagram.

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**5. LTS States**

A description of what each of the FSP process' states represents, i.e. is modelling. If there are a large number of states, then you can group similar states together &/or only include the most important ones. For example, identify any states related to mutual exclusion (ME) & the associated critical section (CS), e.g. waiting to enter the CS state, in the CS state(s), left the CS state. (Add rows as necessary.)

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| **States** | **Represents** |
| 0 | Printer is available to be acquired by either a student or a technician |
| 1 | Printer is acquired by a student |
| 2 | A document with ID = 3 has been printed |
| 3 | Printer is released by a student after printing a document |
| 4 | Printer is acquired by a student |
| 5 | A document with ID = 3 has been printed |
| 6 | Printer is released by a student after printing a document |
| 7 | Printer is acquired by a student |
| 8 | A document with ID = 3 has been printed |
| 9 | Printer is released by a student after printing a document |
| 10 | Printer has run out of paper |
| 11 | Printer has been acquired by a technician to refill the printer |
| 12 | A technician has refilled the printer |
| 13 | A document with ID = 2 has been printed |
| 14 | A document with ID = 1 has been printed |
| 15 | A document with ID = 2 has been printed |
| 16 | A document with ID = 1 has been printed |
| 17 | A document with ID = 2 has been printed |
| 18 | A document with ID = 1 has been printed |

**6. Trace Tree for FSP Process**

The trace tree for the process. Use the conventions given in the lecture notes.

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**7. Structure Diagram**

The structure diagram for the process. Use the conventions given in the lecture notes.

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