**2SD3 Assignment 1**

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1. Diagram

   Description automatically generatedText

   Description automatically generated
2. a)

P1 = A

A = (a -> B | a -> D)

B = (b -> C | c -> D)

C = (a -> D | b -> A | d -> C)

D = (d -> A)

P2 = A

A = (b -> B | b -> C)

B = (b -> E | d -> D)

C = (c -> B)

D = (a -> A | b -> E | d -> C)

E = (a -> A | c -> C)

P3 = A

A = (a -> D| b -> B)

B = (a -> A | a -> C)

C = (b -> B | b -> D | c -> C)

D = (a -> C | c -> A)

A picture containing shape

Description automatically generatedb)

Diagram

Description automatically generated

A picture containing text

Description automatically generatedDiagram

Description automatically generatedA picture containing text

Description automatically generatedDiagram

Description automatically generated

Text

Description automatically generated

Diagram

Description automatically generated

1. In Java File
2. Graphical user interface, text, application, email

   Description automatically generated

FDFD

Diagram

Description automatically generated

Diagram

Description automatically generated

b)

Calendar

Description automatically generated

1. A picture containing archery

   Description automatically generatedB)

A picture containing text, blackboard

Description automatically generated

As we can see, the processes ||S1 and S2 generated isomorphic Labelled Transition Systems. We can say that LTS(||S1) = LTS(S2) as the systems are bisimilar since each possible trace that can be executed from the initial state of ||S1 can also be executed from the initial state of S2. Since the Labelled Transitions Systems of ||S1 and S2 are bisimilar or equivalent, we can then say that the Finite State Processes of ||S1 and S2 are equivalent or bisimilar.

Map

Description automatically generated with medium confidence

These nets are not identical. N1 allows for {a,c} and {d,e} to be executed simultaneously, while N2 does not allow for simultaneity. N2 is similar/isomorphic to the LTS diagrams of ||S1 and S2.

A picture containing diagram

Description automatically generated

A picture containing calendar

Description automatically generatedDiagram

Description automatically generated

9.

Diagram

Description automatically generated

Diagram

Description automatically generatedText

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A picture containing diagram

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12. a)

P0 and S0 are bisimilar as they both allow the actions *a* and *b.*

P1 and S1 are bisimilar as they allow the action *a.*

P2 and S2 are bisimilar as they allow the actions *a*, *b,* and *c*.

P3 and S3 are bisimilar as they allow the actions *a* and *c.*

P4 and S4 are bisimilar as they allow the actions *a* and *b.*

P5 and S5 are bisimilar as they allow the action *c.*

P5 and S6 are bisimilar as they allow the action *c.*

We have proved all states and exhausted all possible cases.

Therefore, P­2 and P3 are bisimilar.

b)

After tracing the string *aa*, P1 would be at either state ­q2 or q3, and P2 would be at state p2. State q2 allows for the actions *a* and *c* to be executed, and state q3 allows for the actions *a* and *b* to be executed. However, state p2 allows for the actions *a*, *b* and *c* to be executed. Thus, q2 and p2 are not bisimilar and q3 and p2 are not bisimilar, therefore making P1 and P2 not bisimilar.

c)

After tracing the string *aa*, P1 would be at either state ­q2 or q3, and P3 would be at state s2. State q2 allows for the actions *a* and *c* to be executed, and state q3 allows for the actions *a* and *b* to be executed. However, state s2 allows for the actions *a*, *b* and *c* to be executed. Thus, q2 and s2 are not bisimilar and q3 and s2 are not bisimilar, therefore making P1 and P3 not bisimilar.

d)

*A picture containing text, picture frame

Description automatically generated*

Blue

blue(P1) = aa(c\* ∪ b\*)ac

blue(P2) = aa(cc\*a ∪ a ∪ bb\*a)c = aa(c\* ∪ b\*)ac

blue(P3) = aa((cc\*a ∪ a)c ∪ bb\*ac) = aa(c\* U b\*)ac

blue = blue(P1) = blue(P2) = blue(P3) = aa(c\* ∪ b\*)ac

Pink

pink = pink(P1) = pink(P2) = pink(P3) = bb\*ac

cycles = (blue ∪ pink)\* -> (from q0 to q0, p0 to p0, s0 to s0)

Traces(P­1) = Traces(P­2) = Traces(P­3) = Pref((blue ∪ pink)\*) = Pref((aa(c\* ∪ b\*)ac ∪ bb\*ac)\*)