UNIVERSITÄT KOBLENZ · LANDAU

Business Process Management

Exercise 4

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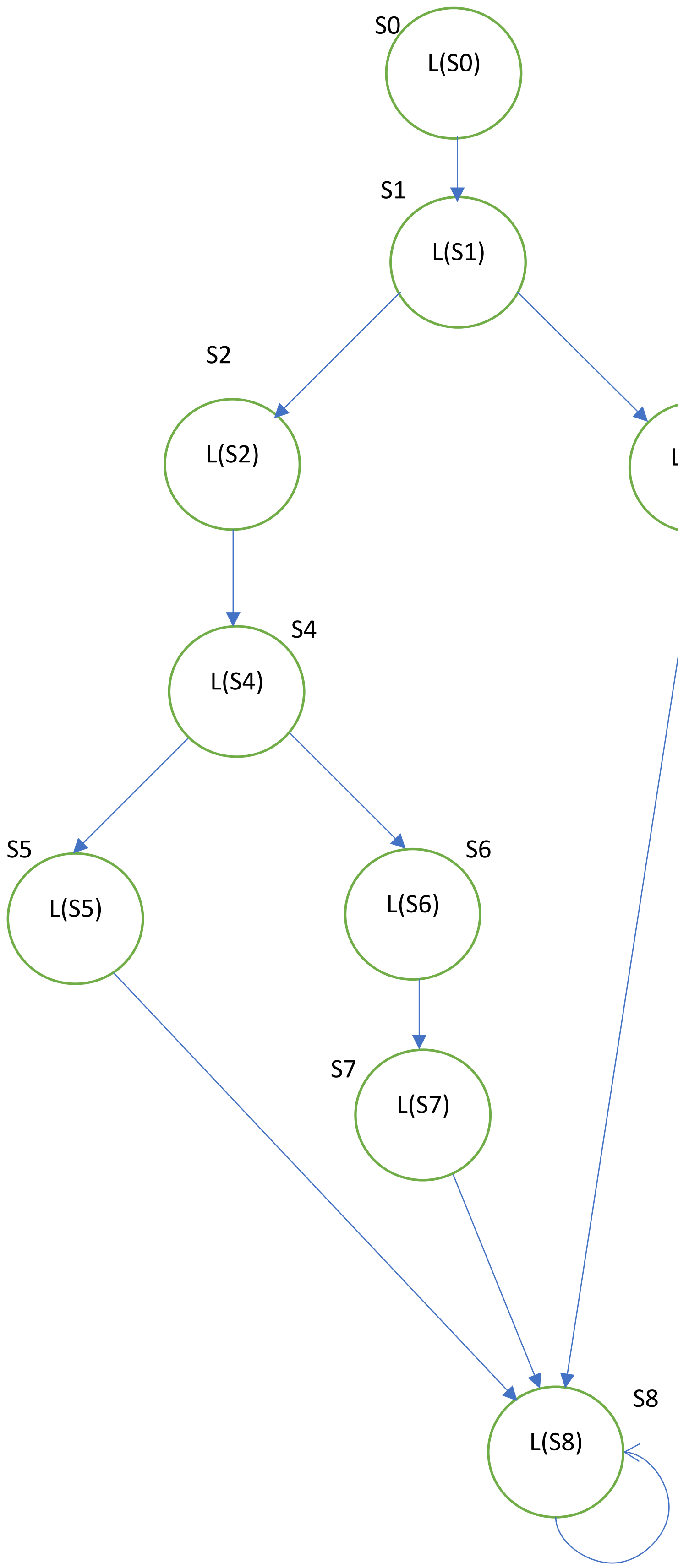
TOTAL: 9,5/10

TASK 1 5,5/6

- **Transition System:**



M = (S,Rt ,L)

S = {s0, s1, s2, s3, s4, s5, s6, s7, s8}

Rt = { (s0,s1) , (s1,s2), (s1,s3), (s2,s4), (s4,s5), (s4,s6), (s6,s7), (s7,s8), (s5,s8), (s3,s8), (s8,s8) }

L(S0) = {start}

L(S1) = {n_check_order}

L(S2) = {n_process_order}

L(S3) = {n_inform_customer}

L(S4) = {n_verify_order , o_boss}

L(S5) = {n_ship_order}

L(S6) = {n_write_report}

L(S7) = {n_inform_employee , o_employee}

L(S8) = {end}

- **CTL formulas**

1. The order has to be verified, before it can be shipped.
   → M, S0 = A [¬ n_ship_order U n_verify_correctness]

2. The order has to be verified by the boss.
   - M, S0 = ¬EF (n_verify_order ∧ ¬ o_boss)

3. If the order is not correct, an employee has to be informed about this.
   - M, S0 = AG (n_write_report → AF(n_inform_employee)

     EF (-0,25)

4. If the customer is informed that the product is unavailable, the order needn't be verified by the boss (to save time).
   - M, S0 = AG (n_inform_customer → AF (¬ n_verify_order))

     EF (-0,25)

TASK 2 2/2

1. Depicted is a transition system M = (S, R, L). Please explain, if the following CTL formulas satisfy M in regard to the respective s ∈ S: (If yes, you can simply make a checkmark. If no, please explain why not.)

   - M, s1 |= EX (¬p) → ✓ (True)
   - M, s1 |= AX(¬p) → × (There exist a path from S1 to S0 where p is present)
   - M, s1 |= AG (q V r) → ✓ (True)
   - M, s0 |= A [q U r] → ✓ (True)

TASK 3 2/2

1) In the lecture, a transition system M was defined as a tuple M = (S,R,L). S is the set of states and R is the set of relations. L is a labeling function. More specific, this labelling is defined as a function L: S → 2AP . Briefly explain this function L in your own words. What does it do and why does it say 2AP? For your solution, you can assume the atomic propositions are a set AP = {A,B,C}

L: S → 2^AP (L = Labeling Function, S = States, AP = Atomic Proposition)

AP = {A,B,C}

We have three labels A, B and C. Now we have to assign labels to the states we have in the model(could be any number of states). L is the labeling function that assigns to any state S one element from 2^AP which is the power set of atomic propositions i.e all the possible combinations of labels.

Suppose we have 2 states s0 and s1 such that S = {s0,s1}

and AP = {A,B,C} = 3,

Then 2^AP will be 8

Power set will be of 8 elements :

{ - , A, B, C, AB, BC, AC, ABC }

Now L will assign any one element from this power set to a state. For e.g :

L(s0) = AB

L(s1) = ABC