5

CHALMERS

Anonymous code
Anonym kod
SSY 165 -20

Points for question (to be filled in by teacher)
Poäng på uppgiften (fylles av lärare) 3

Consecutive page no.
Löpande sid nr 1

Question no.
Uppgift nr 1

$$\exists x\,[p(x)] \wedge q \Rightarrow \exists x\,[p(x) \wedge q]$$

The Universal set, Ω, for the variable x is

$$\Omega = \{a_1, a_2, \ldots, a_n\}$$

$$\exists x\,[p(x)] \wedge q \Leftrightarrow [p(x_1) \wedge p(x_2) \wedge p(x_3) \wedge \ldots \wedge p(x_n)] \wedge q$$

$$\Leftrightarrow [(p(x_1) \wedge q) \wedge (p(x_2) \wedge q) \wedge (p(x_3) \wedge q) \wedge \ldots \wedge (p(x_n) \wedge q)]$$

$$\Leftrightarrow \exists x\,[p(x) \wedge q]$$

$\therefore$ for $p \Rightarrow q$ to be an implication, the contradiction is given by $p \wedge \neg q \Rightarrow \mathbb{F}$ [i.e. $p \Rightarrow q$ iff $p \wedge \neg q \Rightarrow \mathbb{F}$]

$$\therefore \left[\exists x\,[p(x)] \wedge q\right] \wedge \neg \left[\exists x\,[p(x) \wedge q]\right] \Leftrightarrow$$

$$\left[\exists x\,[p(x) \wedge q]\right] \wedge \neg \left[\exists x\,[p(x) \wedge q]\right] \underset{E_{17}}{\Leftrightarrow} \mathbb{F} \quad //$$

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CHALMERS

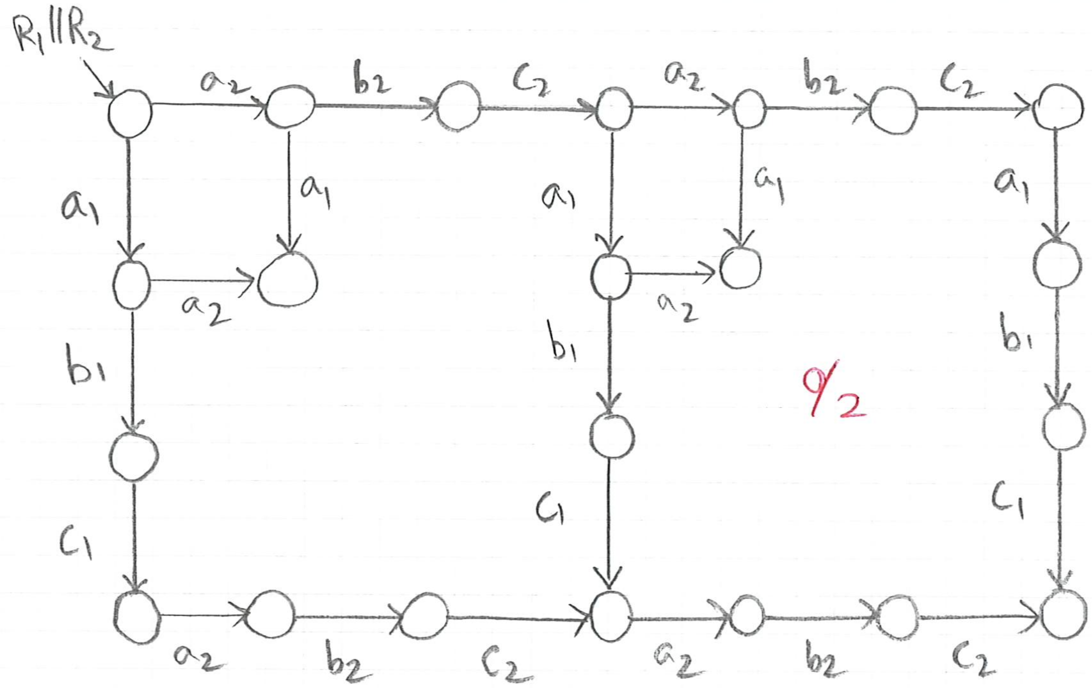
Anonymous code / Anonym kod: SSY165-20

Points for question (to be filled in by teacher) / Poäng på uppgiften (ifylles av lärare): 0

Consecutive page no / Löpande sid nr: 2

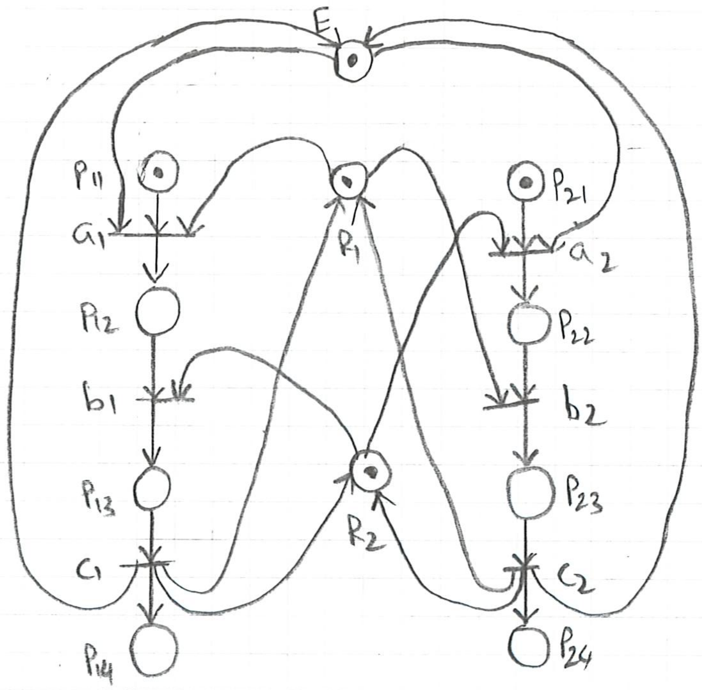
Question no. / Uppgift nr: 2

a)



0/2

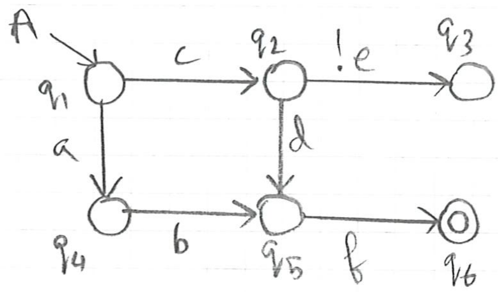
b)



0/2

By adding a control place, E, we can regulate the flow of tokens when there ~~are~~ is more than one initial in place P_{11} or P_{21}.

a)

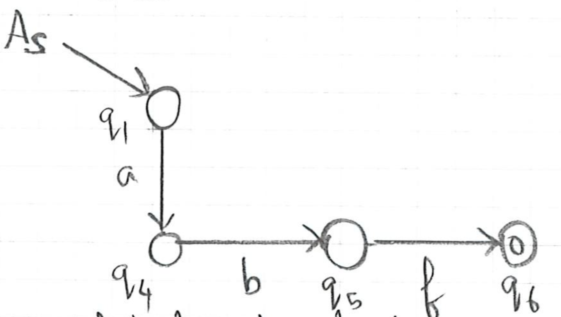


Event 'e' is uncontrollable event

* Here the uncontrollable event 'e' leads to a blocking state.

* Therefore 'q_2' is an uncontrollable state and must be avoided in the supervisor to reach the marked state.

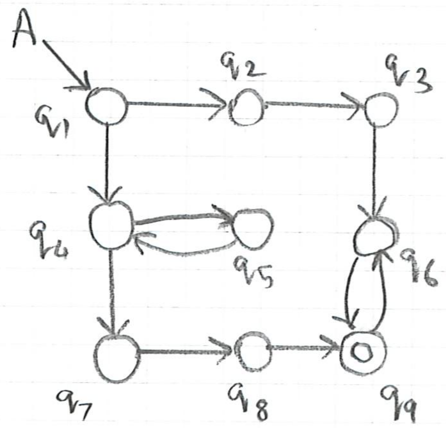
1/2



no specification!

* A state which leads to uncontrollable event, is an uncontrollable state.

b)



2/2

* States q_4 and q_5 do not lead to a deadlock, but they lead to a livelock.

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Points for question / Poäng på uppgiften

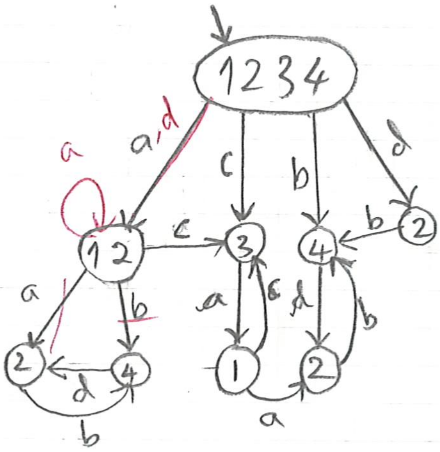
Consecutive page no. / Löpande sid nr: 4

Question no. / Uppgift nr: 3

* The automaton has no deadlock states and it is nonblocking.

q_4, q_5, q_6, q_9 are the nonblocking states; since they cause a loop such that the automaton is never blocking.

a)



0/3

b) After observing all the events, any number of times, the states 1 and 3 cannot be detected, whereas states 2 and 4 can be detected by the observer.

0/1

a) $\rho = \dfrac{\lambda}{\mu}$ is utilization factor.

Average number of jobs in buffer,

$$\bar{N}_Q = 0P_0 + 1P_1 + 2P_2 + \dots + jP_j$$

where 'j' is the number of jobs.

$$\therefore \bar{N}_Q = \sum_{j=0}^{n} j P_j$$

w.k.t, $P_j = \rho^j P_0 = \rho^j (1-\rho)$

$\therefore$ for $n \to \infty$

$$\bar{N}_Q = (1-\rho) \sum_{j=0}^{\infty} j \rho^j$$

$$= (1-\rho) \frac{\rho^2}{(1-\rho)^2}$$

$$\bar{N}_Q = \frac{\rho^2}{(1-\rho)}$$

3/3

b) Total Daily cost is $10+N_Q$ (service rate $=1.2\mu$)

∴ Increase in capacity and machine cost by 20% gives

$$20\%[10+N_Q] = 0.2\left[10+\frac{\rho^2}{1-\rho}\right] = 2+\frac{0.2\rho^2}{1-\rho}$$

∴ Total daily cost becomes $:= 10+N_Q + 2 + \frac{0.2\rho^2}{1-\rho}$

$$12+\frac{1.2\rho^2}{1-\rho}$$

$$=12+\frac{1.2\rho^2}{1-\rho}$$

Utilization factor $\rho = \frac{1}{1.2}\frac{\lambda}{\mu} = 0.833\frac{\lambda}{\mu}$

Why do you have two values?

1/2

$$\therefore\ 12+\frac{1.2(0.6938)\rho^2}{1-0.833\rho}=0$$

$$12-9.996\rho+0.8325\rho^2=0$$

$$0.8325\rho^2-9.996\rho+12=0$$

$$(\rho-10.65)(\rho-1.35)=0$$

$\rho = 1.35$

It would be efficient to have $\rho=1.35$ of the original system.

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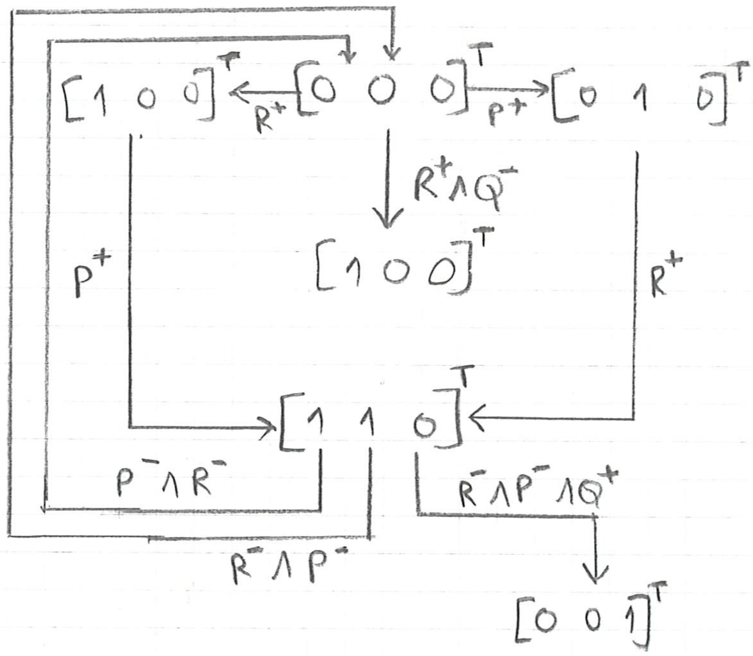
Points for question (to be filled in by teacher)

Poäng på uppgiften (ifylles av lärare) 2

Consecutive page no / Löpande sid nr 8

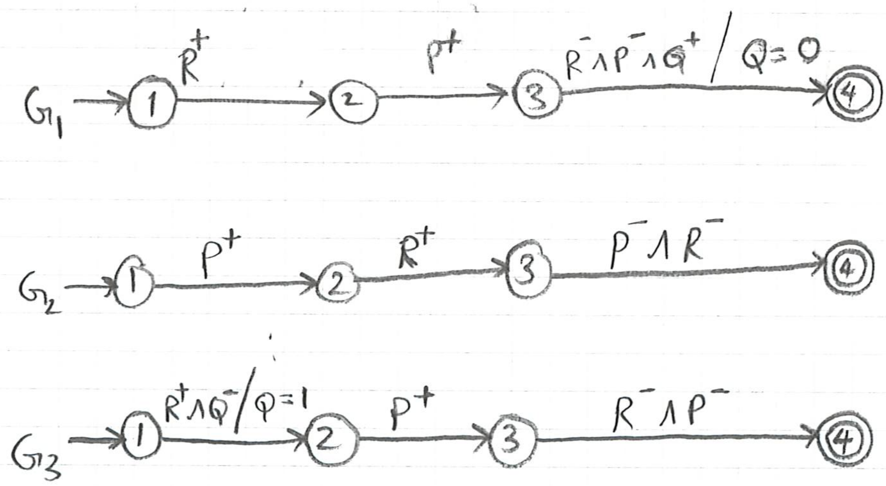
Question no. / Uppgift nr 4

a)



0/3

b)



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