HW #5
ECE 6750

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4.6

Fig. 4.37 (a)

4.6.1 : The Petri-Net is not bounded. (Place between transitions a+ & a+)
Since it's not bounded, it is not safe

4.6.2 : L4- live or live

Fig. 4.37 (b)

4.6.1 : The Petri-Net is k-bounded.
K=1.
∴ it is safe (∵ K=1)

4.6.2 : L4-live or live

Fig 4.37 (c)

4.6.1 : The Petri-Net is k-bounded
K=1
∴ it is safe (∵ K=1)

4.6.2 : L4- live or live

Fig 4.32

(d)

4.6.1: The Petri-Net is k-bounded

$k = 1$

∴ it is safe ($\because k = 1$)

4.6.2: The Petri-Net is not live (dead)

Transition	degree of liveness
a^+	dead (L0)
b^+	"
a^-	"
b^-	"
c^+	L1
e^+	"
d^+	"
c^-	"
e^-	"
d^-	L1 - live

↳ { L2 - live, L2 - live } with $k = 2$

This is because there are two instances of c^- & e^- in the Petri-Net, and they get fired in a sequence

4.7

Fig. 4.37	State Machine	Marked Graph	Free Choice Net	Ex. Free Choice Net	Asymm. Choice Net
a)	X	✓	✓	✓	✓
b)	X	X	✓	✓	✓
c)	✓	X	✓	✓	✓
d)	X	X	X	✓	✓

4.11

Fig 4.39 (a)

1. Not-Live : ~~Aft~~ Consider the sequence a^+, c^+, c^-. After this sequence has been fired a^+ can't be fired again, and the branch with transitions b^+, a^-, b^- is never fired.

2. Safe ✓

~~Not persistent~~

4. single-cycle transition ✓

3. Not-Persistent:
Consider the arc $a^+ \rightarrow c^+$, and the sequence, a^+, b^+, a^-.
So c^+ has not fired, but a^- has fired. So according to definition the Petri-Net is not-persisent

Fig. 4.39(b)

1) Live ✓

2) Not-safe: Consider the sequence x^+, y^+, x^-, y^-. Then the place between w^+ & y^- will have two tokens

3) Not-persisent: Consider the arc, $y^- \rightarrow w^+$ and the sequence x^+, y^+. So ~~there is a token~~. Before w^+ could fire y^+ has fired

4) Single-cycle transition ✓

Fig. 4.39(c)

1) Live ✓

2) Safe ✓

3) Persistent ✓

4) Single-cycle transition ✓

Fig 4.39 (d)

1. Not-live: since b^+ can't be fired in any marking from the initial marking

2. Safe ✓

3. Persistent ✓

4. Single-cycle-transition ✓

Fig 4.39(e)

1. Live ✓

2. Safe ✓

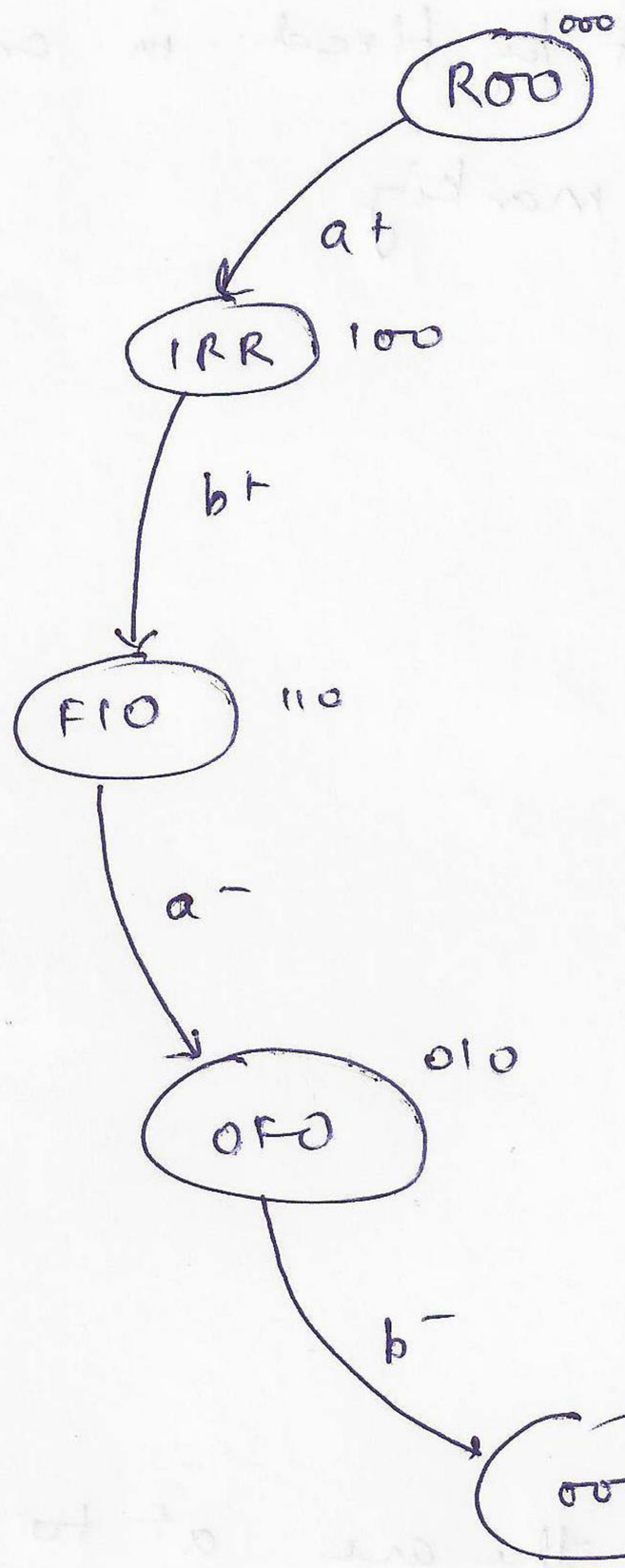
3. Not-Persistent: Consider the are a^+ to c^+ and the sequence a^+, b^+, a^-. ∴ a^- has fired before c^+ can fire.

4. Single-cycle transition ✓

4.12

4.39(a)

abc

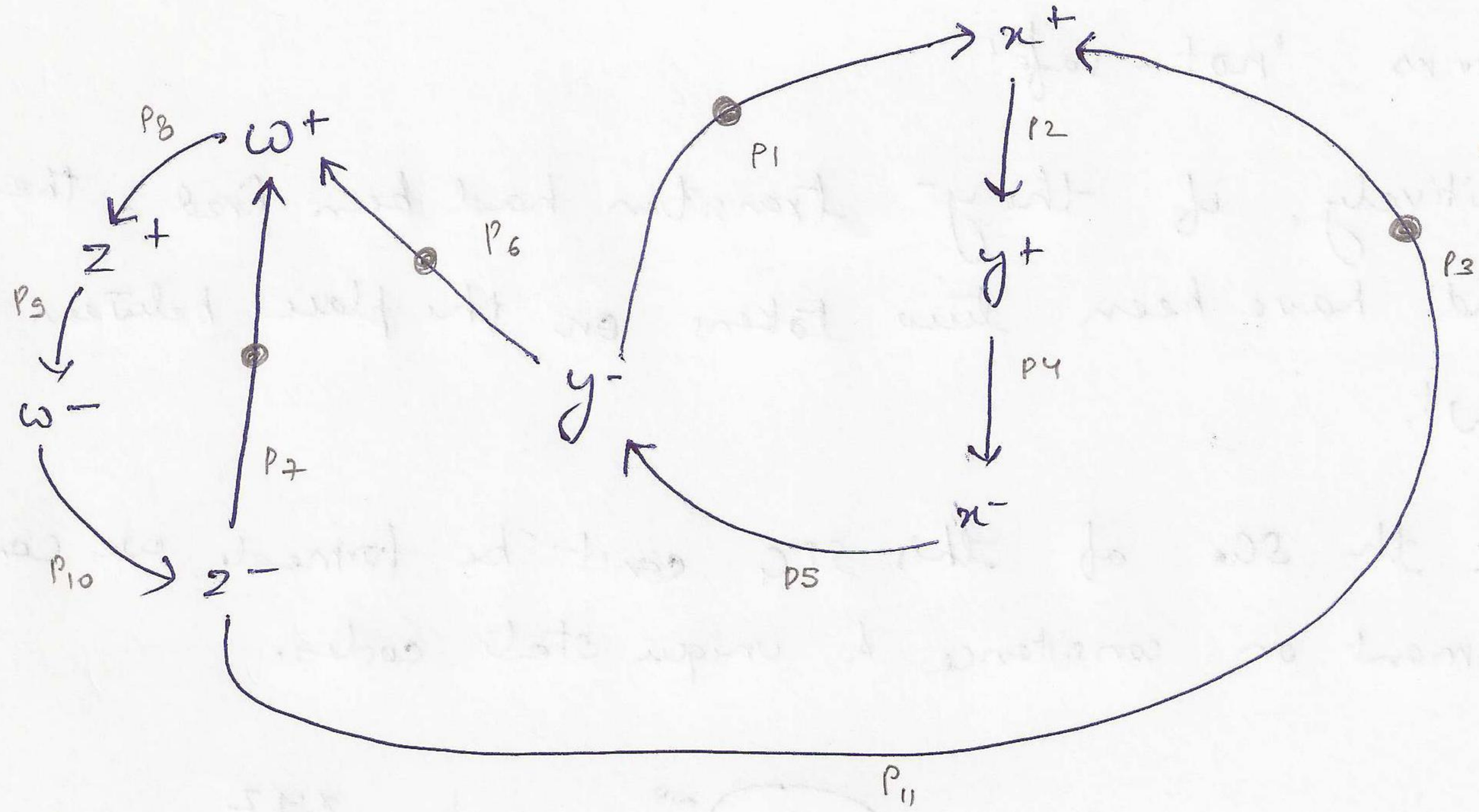


According to the find-SCs algorithm in the book if at a state we find that the set of possible transitions Te is empty, the algorithm returns "STG deadlocks" & quits.

∴ the SG for this STG can't be built

Also since the definitions of consistence & unique state assign. are defined for SGs, we cannot comment on these two properties for this particular STG.

(b)



STG with initial markings.

If we follow the algorithm find_SG and follow the sequence, x^+, y^+, x^-, the ~~current value for~~ set M would be $M = \{P_5, P_6, P_7\}$. In the next iteration the instruction $if((M - \bullet t) \cap t\bullet \neq \phi)$ will be true

$\Rightarrow$ $M = \{P_5, P_6, P_7\}$

$\bullet t = P5$ (assuming that y^- is the next ~~instruc~~ transition to be fired)

$t\bullet = \{P_1, P_6\}$

$\therefore (M - \bullet t) \cap t\bullet$

$= (\{P_5, P_6, P_7\} - \{P_5\}) \cap (P_1, P_6)$

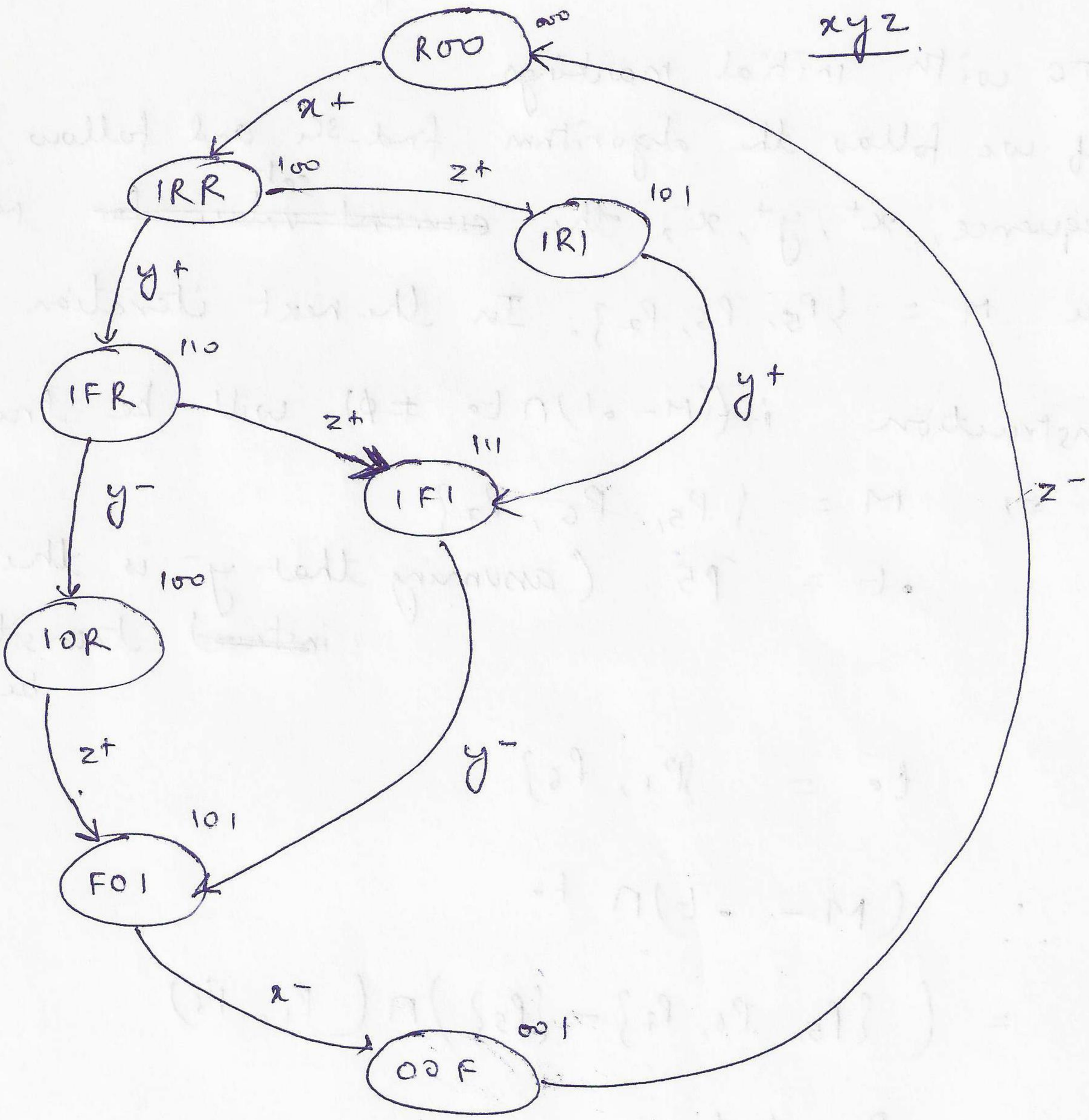
$= P_6 \neq \phi$

Hence the 'if' block is executed and the algorithm returns 'not-safe'

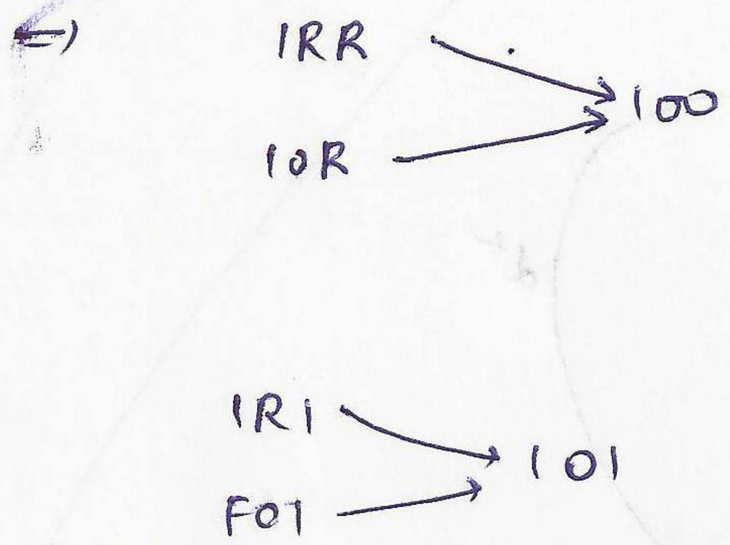
Intuitively, if the y^- transition had been fired, there would have been two tokens on the place between z^- & w^+.

Since the SG of this STG can't be formed, we cannot comment on consistence & unique state codes.

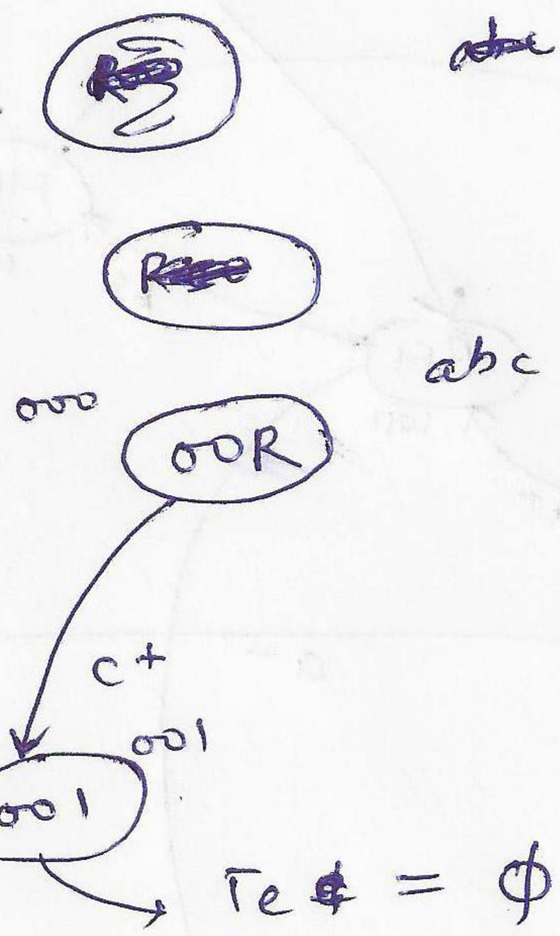
(c)



The the SG has consistent state assignement.
But it is not Unique state assignment as two different markings have same signal values



(d)

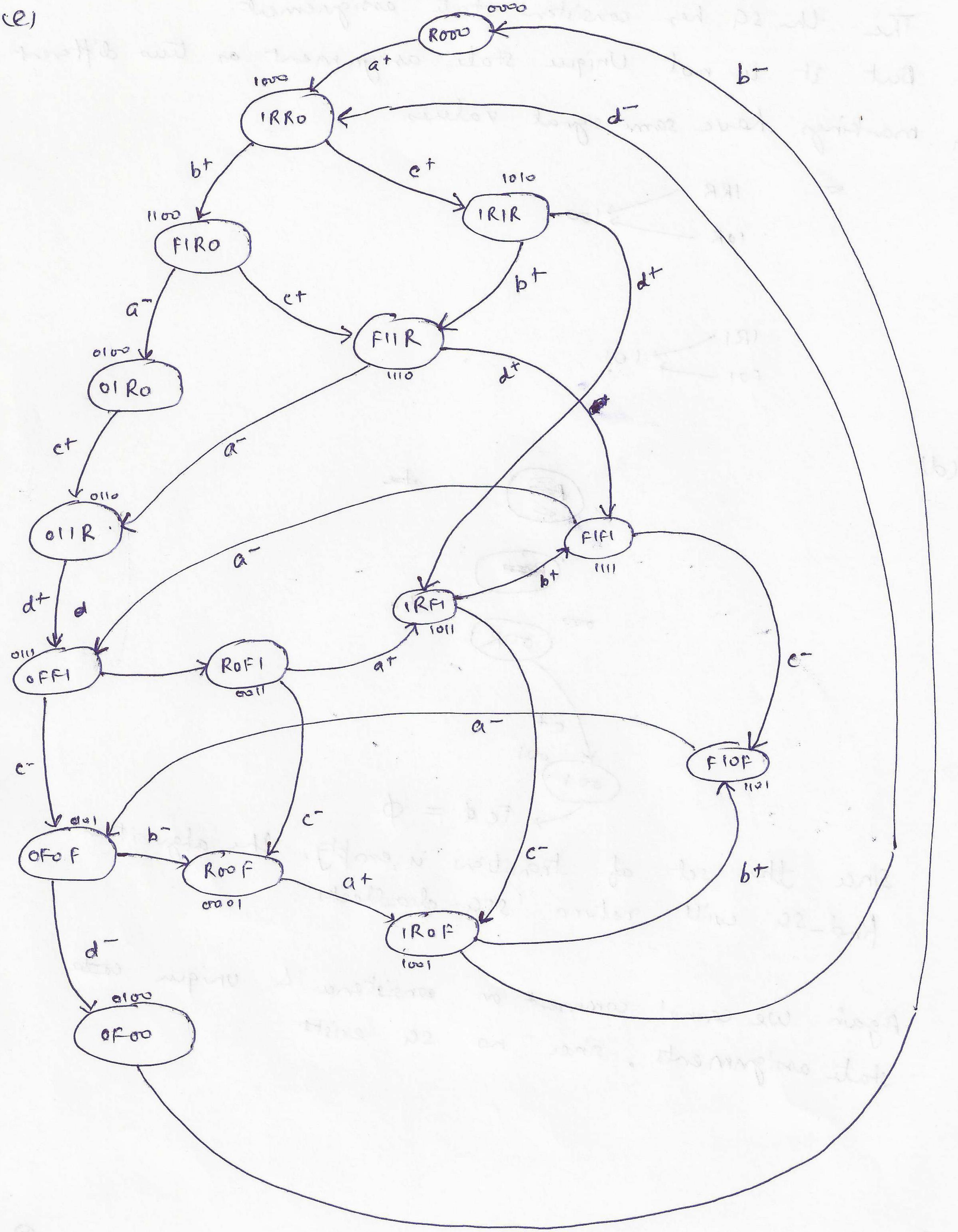


$Te\phi = \phi$

Since the set of transitions is empty, the algorithm find_SG will return 'STG deadlocks'.

Again we cannot comment on consistency & unique state assignments, since no SG exists.

(e)


0000
R000
a+
b−
1000
1RR0
d−
b+
c+
1010
1R1R
1100
F1R0
c+
a−
F11R
1110
d+
0100
01R0
c+
0110
011R
a−
F1F1
1111
d+
d
b+
1R F1
1011
0111
0FF1
R0F1
0011
a+
c−
a−
F10F
1101
c−
0001
0F0F
b−
R00F
0001
c−
c−
a+
b+
1R0F
1001
d−
0100
0F00

The SG is consistent state assignment

But, it is not unique state assignment as two different markings have same signal values :-