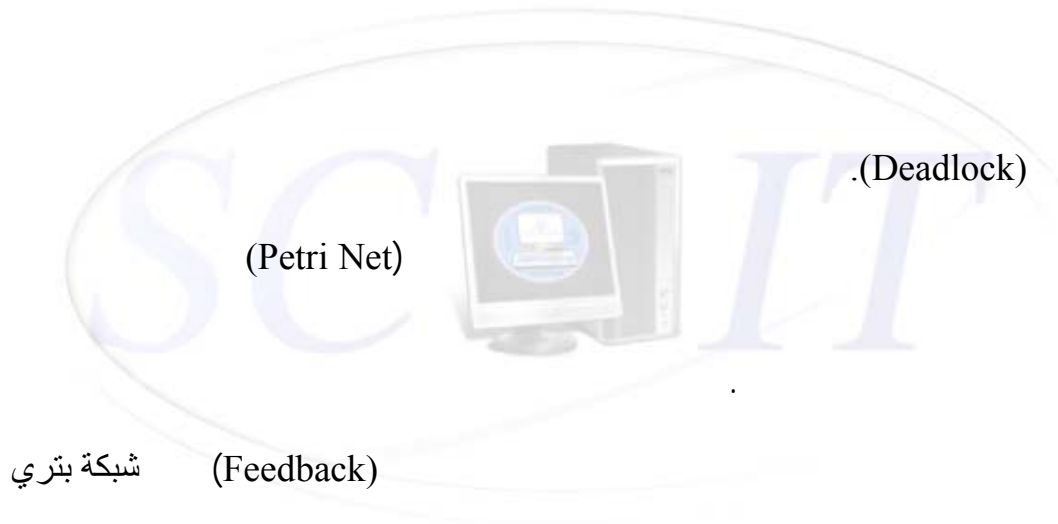


## Using A Petri Net Concepts To organize The Resources Sharing Between Two Processors

/



### Abstract

With the development of information technology and the use of its applications as an essential aspect in almost all patterns of life especially in fields of analysis and real time systems, a problem of controlling resources appeared and how to provide the system with the resources at a proper time to avoid the system to be failed or vanishes , a state called a deadlock. This research aims to use the modern concept of Petri Net to provide synchronization and coordination between systems having more than one processor , sharing a specific resources at a same time. The research concentrates on capability of applying feed backing concept of Petri Net to achieve a good synchronization between different systems to work efficiently without being in deadlock.

.1

(Synchronous) (System)  
(Nondeterministic) و (Parallel) (Distributed)  
[9][8]. (Stochastic)

Carl Adam Petri

(Mathematical) (Modeling Tools) 1962

(Graphical)

(Visual Communication) كاتصالات مرئية

(Block Diagram)

(Flow Chart)

[10] ، و

(Semantic Model)

(High-level Petri Nets)

(Petri Net Markup Language (PNML))

[7] .

(Baukasten)

-:

-1

-2

-3

-4

[3] .

-5

(Deadlock)

(Recourses)

(Processors)

(Processor)

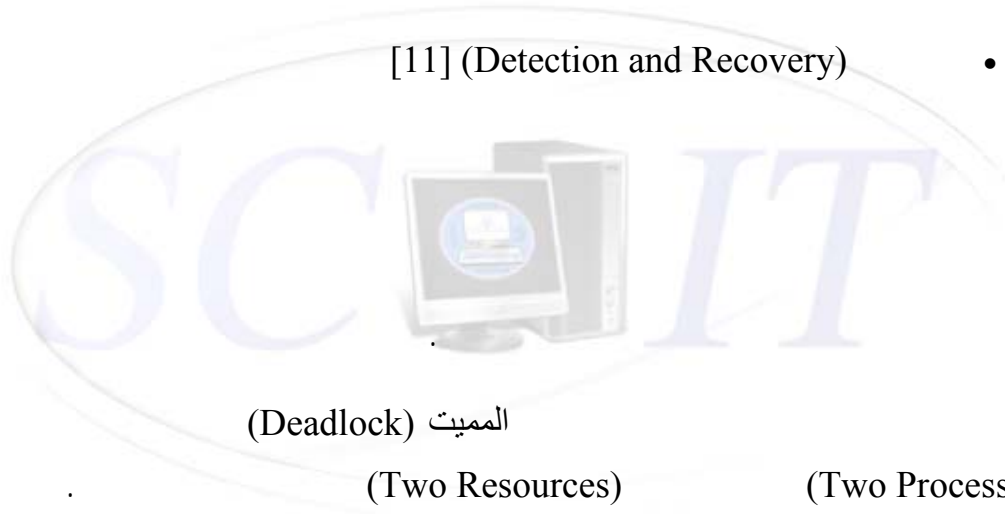
[1] (Deadlock)

-:

(Prevent) •

(Avoidance) •

[11] (Detection and Recovery) •



المميت (Deadlock)

(Two Resources)

(Two Processor)

**Petri Net .2**

(Places) وانتقالات

(Arcs)

(Transition)

[6] .

(Tokens)

(Initial )

(Firing)

بتري

(Marking(M0))

[2].

(1) [4] (Event) (Conditions)

[4] (1)

Input Place	Transition	Output Place
Precondition	Event	Post Condition
Input Data	Computation Step	Output Data
Input Signal	Signals Process	Output Signals
Resources Needed	Task or Job	Resources Released
Buffers	Processor	Buffers

## 2.1

شبكة بتري  
 $PN = (P, T, F, W, M_0)$  :-

$$P = \{P_1, P_2, P_3, \dots, P_m\}$$

$$T = \{t_1, t_2, t_3, \dots, t_n\}$$

$$F = \subseteq (P \times T) \cup (T \times P)$$

$$W = F \rightarrow \{1, 2, 3, \dots, n\}$$

$$(Marked) \quad M_0 = P \rightarrow \{1, 2, 3, \dots, m\}$$

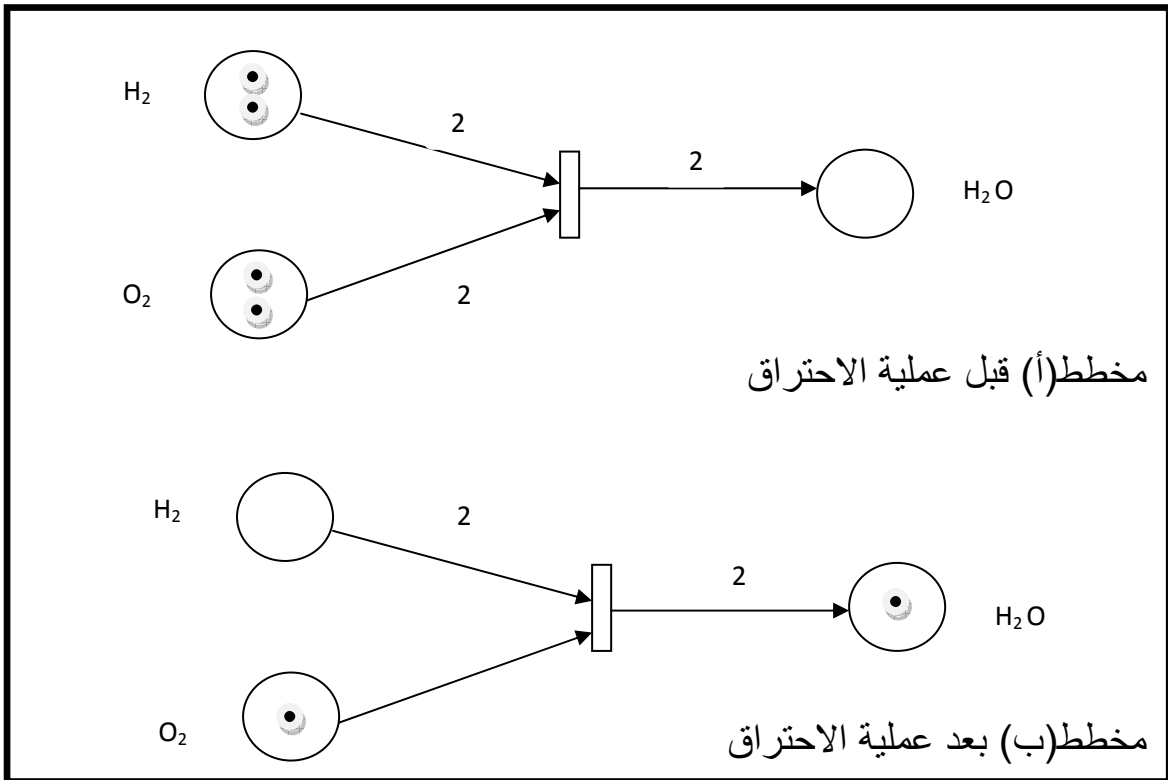
$$P \cap T = \emptyset \text{ and } P \cap T \neq \emptyset$$

شبكة بتري :-

W(P,T) token (P) of (T) (T) الانتقال 1-

(T) (P) (Arc) W(P,T)

النظام.	(T)	-2
W(P,T) token	(T)	-3
W(P,T)	(T) (P)	رمز W(P,T) (T) (P)
رمزان	(P) (T)	token
	( ) (1)	واحد من الأماكن
	التفعيل	
	( ) (1)	



Petri Net

(1)

(T)

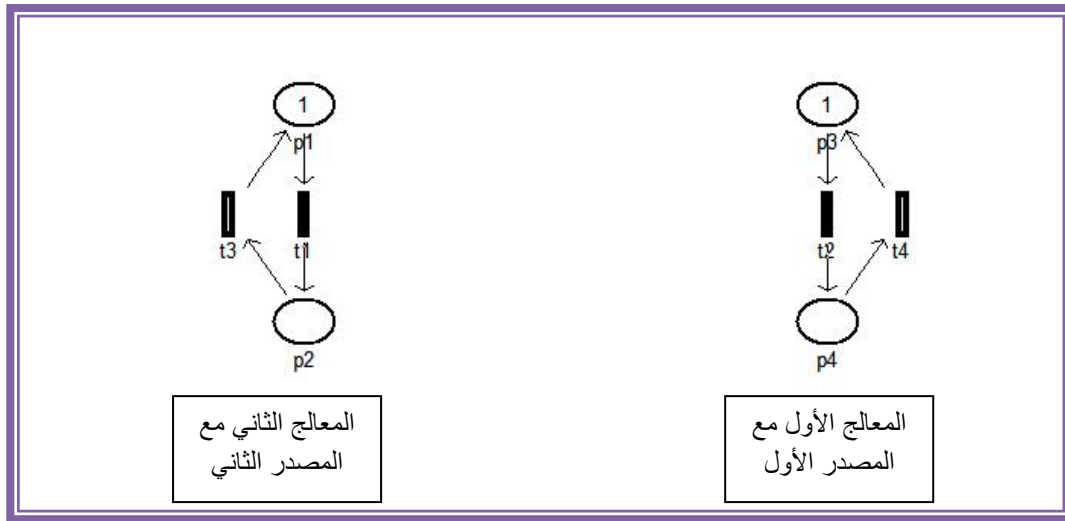
(Place)

k(p)

k(p)

(T) (P)

(2)



Petri Net

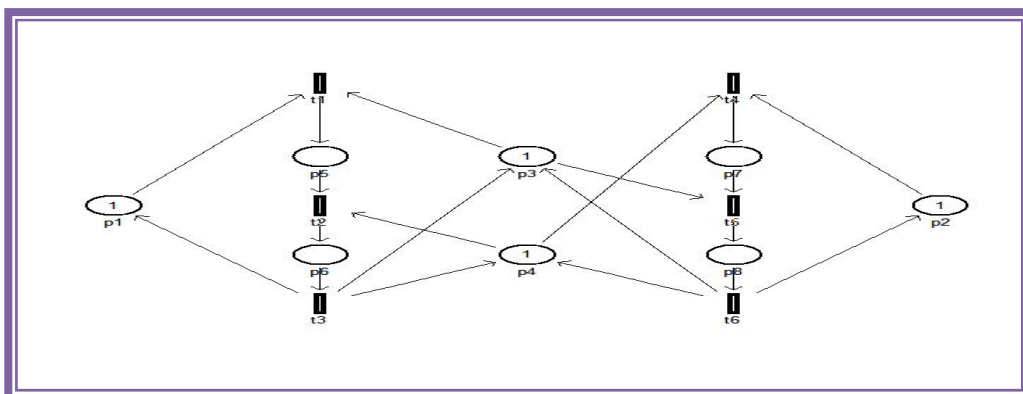
(2)

$\{P2, P4\}$                        $\{P1, P3\}$   
 (Token)  
 شبكة بتري                      (Transition)                       $\{t1, t2, t3, t4\}$   
 [5]  
 .(Deadlock)

Petri Net

3.1

-(3)



(3)

{P1,P2,P3,P4,P5,P6,P7,P8}

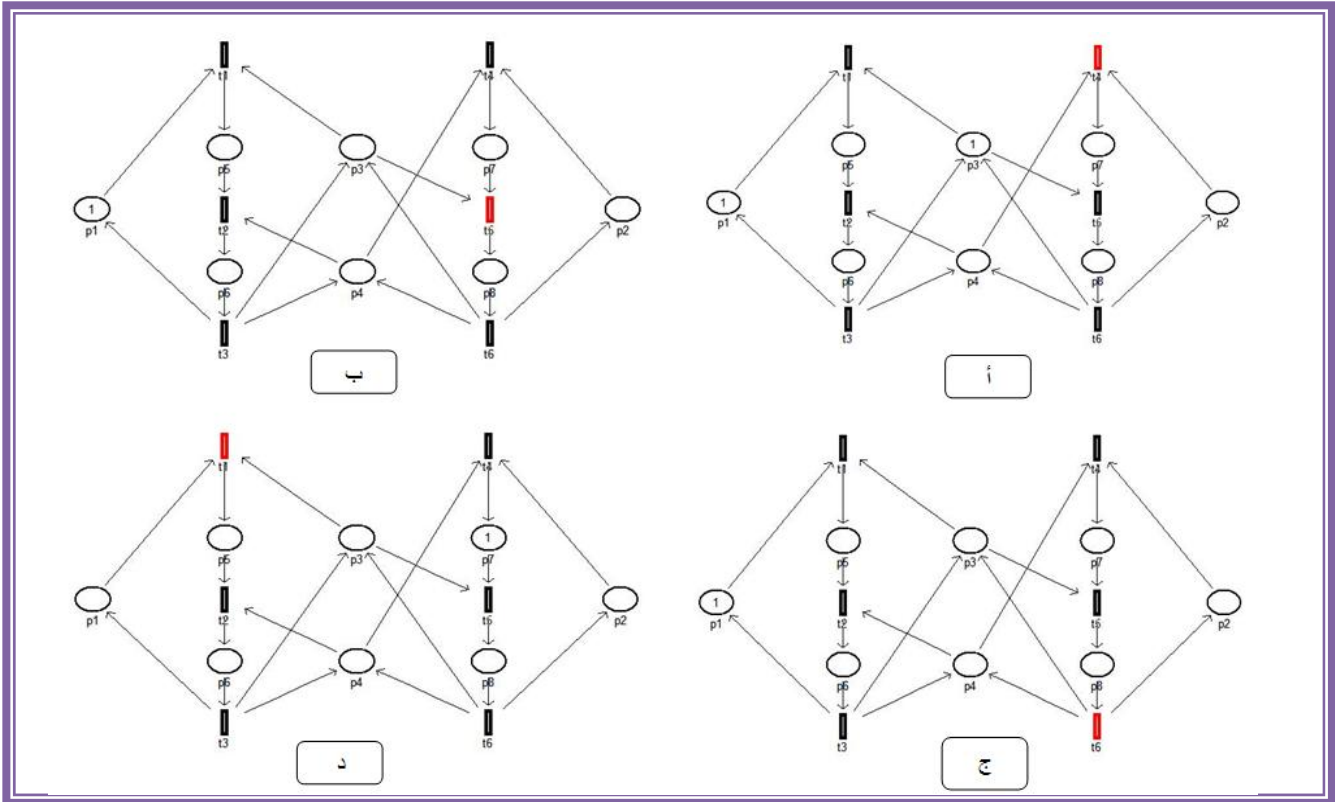
الانتقالات {t1,t2,t3,t4,t5,t6}

{P1,P2,P3}

(Token)

(4)

(firing)



firing

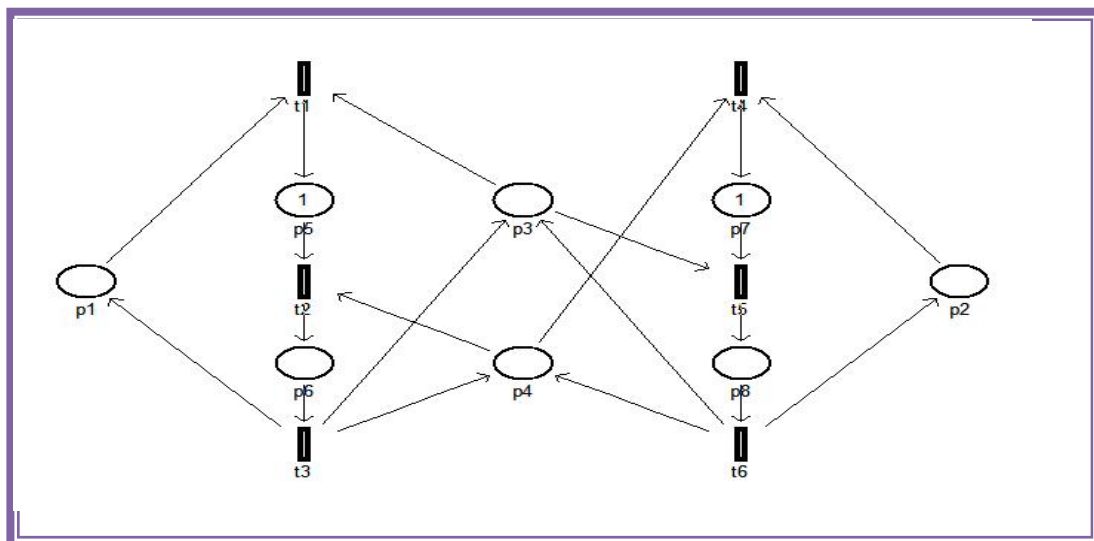
(4)

t1 or t4

لتفعيل ستم

نموذج شبكة بتري :-

- |            |                         |     |    |    |
|------------|-------------------------|-----|----|----|
| رمز (p7) . | من {p2 , p4}            | ( ) | t4 | 1. |
|            | (p8) .                  | ( ) | t5 | 2. |
|            | من {p2 , p3, p4}        | ( ) | t6 | 3. |
|            | t4 (p5)                 | ( ) | t1 | 4. |
|            | رمزان كلا {p5 , p7}     | (1) |    |    |
| t2 , t5    | القفل المميت (Deadlock) |     |    |    |
| (5)        | t                       | (5) |    |    |



Deadlock

(5)

-:

(2)

. t

-: Event

.

-: Arrival Sum

.

: Throughput Sum

Event 5

Places

(2)

Place Name	Arrival Sum	Throughput Sum
p1	0	1
p2	1	2
p3	1	2
p4	1	2
p5	1	0
p6	0	0
p7	2	1
p8	1	1



**Deadlock**

**Lookhead Feedback**

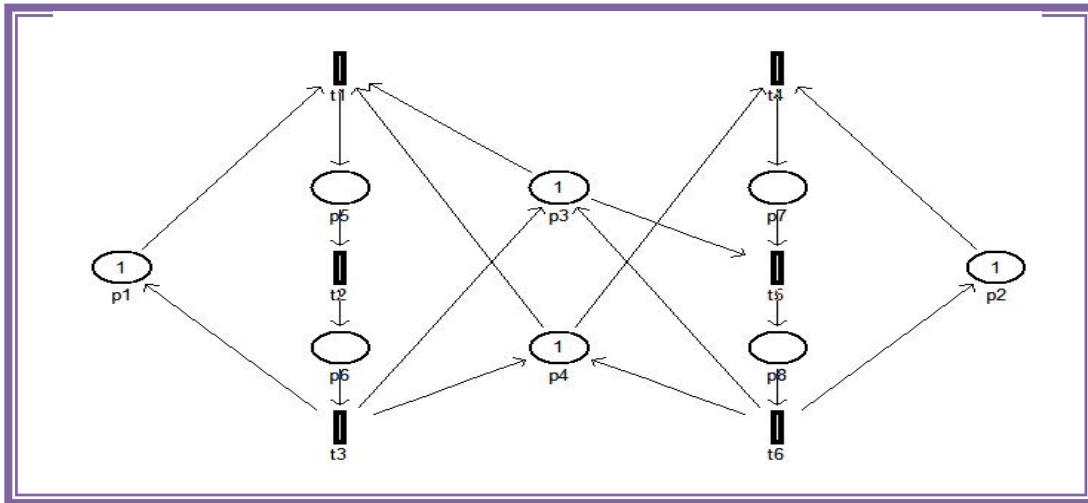
**3.2**

Deadlock

(Tokens)

(t)

(5)



الـ Deadlock

(5)

p4 and t1

(arc)

p4 and t2

.(

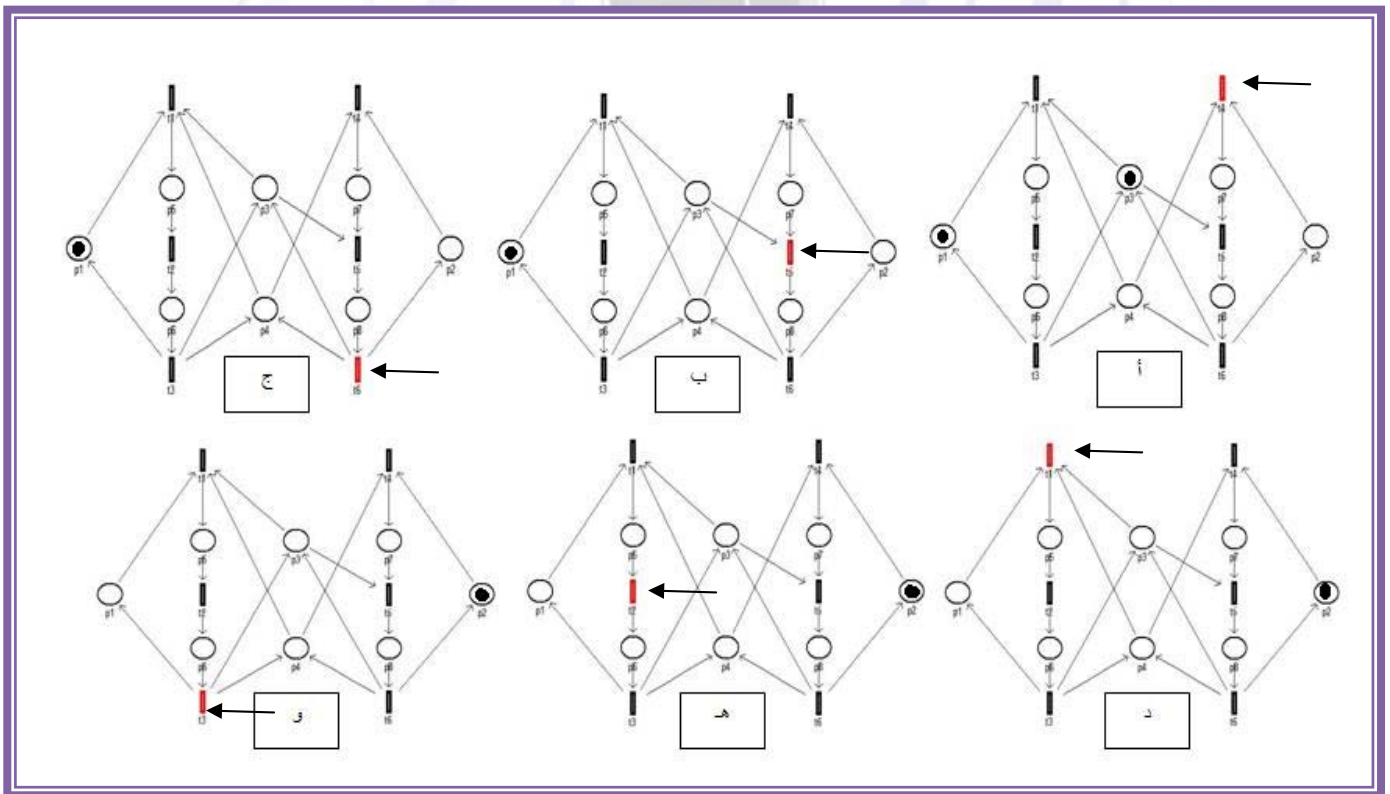
)

(6)

t1 or t4

:-

- . (p7) {p2 , p4} ( ) t4 -1
- . (p8) ( ) t5 -2
- . {p2 , p3 , p4} ( ) t6 -3
- . (p5) ( ) t1 -4
- . (p6) ( ) t2 -5
- . {p1 , p3 ,p4} ( ) t3 -6



Firing (6)

(6) (1)

(3)

-(10) (Event)

**Event 10 Places (3)**

Place Name	Arrival Sum	Throughput Sum
p1	1	2
p2	2	2
p3	3	4
p4	3	4
p5	2	1
p6	1	1
p7	2	2
p8	2	2

.4

(Deadlock)

(Lookhead Feedback)

(Real Time System)

. (3.2)

(6,5)

## References

- 1- Commoner F. 'Deadlock in Petri Nets' Weak field Applied Data Research Inc, 1972.
- 2- David R. , Alla H. , Discrete, 'Continuous, and Hybrid Petri Nets' publisher by Springer, 2005.
- 3- Ehrig H. , Reisig W. , Rozenberg G., Weber H. , 'Petri Net Technology for Communication-based Systems', publisher by Springer, 2003.
- 4- Galbo B. and et al., "Introductory Tutorial on Petri Nets", Petri Nets Conference, June 2000, Aarhus, Denmark.
- 5- Holt A. W. and Commoner F., 'Event and Conditions', Applied Data Research Inc, 1970.
- 6- Home Page '<http://www.daimi.au.dk/PetriNets>.
- 7- International Standard ISO/IEC 15909-2 WD Version 0.9.0, 'Software and Systems Engineering – High-level Petri Nets Part 2: Transfer Format', June 23, 2005.
- 8- Magott J. 'Performance evaluation of concurrent systems using Petri Net', Inform. Processing Lett, 1984.
- 9- MURATA T. 'Petri Nets Properties, Analysis and Applications' ,FELLOW, IEEE, Invited Paper APRIL 1989.
- 10- Petri C.A. , 'Kcommunication with Automata' , English translation NewYork, 1966.
- 11- Silberschatz A., Galvin P. , Gagne, 'Operating System Concepts, fifth Edition', Addison Wesley Longman, 1998.