

**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT**  
**MID TERM EXAMINATION (SEPTEMBER-2013)**  
**B.Tech V Semester (CSE/ICT)**

COURSE CODE: 10B11CI511

MAX MARKS: 30

COURSE NAME: Operating Systems

COURSE CREDITS: 4

MAX. TIME: 2HRS

- 1) An office has a matrix cubicle structure. Each cubicle has a fan, though a fan can cater to 2 cubicles at a time. Due to rising electricity bill the management has decided not to allow a fan to switch on if any of its adjacent fans is switched on. Create a procedure that fulfills this requirement. The main thread entertains a new request to switch on a fan and a worker thread is created for each request that decides whether the request will be granted or not.

(5 Marks)

2) a) :

```
Process p0
while (true) {
    flag[0] = true;
    while (flag[1]) {
        flag[0] = false;
        flag[0] = true;
    }
    critical_section();
    flag[0] = false;
}
```

```
Process p1
while (true) {
    flag[1] = true;
    while (flag[0]) {
        flag[1] = false;
        flag[1] = true;
    }
    critical_section();
    flag[1] = false;
}
```

Does the above code meet the following requirements:

- i. Progress
- ii. Bounded Waiting
- iii. Mutual Exclusion

State yes or no for each and justify your choice.

(3 Marks)

- b) The following 5 processes given as process\_name(priority(highest 1 – lowest 10), no. of resources used, time executes in ms, time remaining in ms, no of rollbacks)

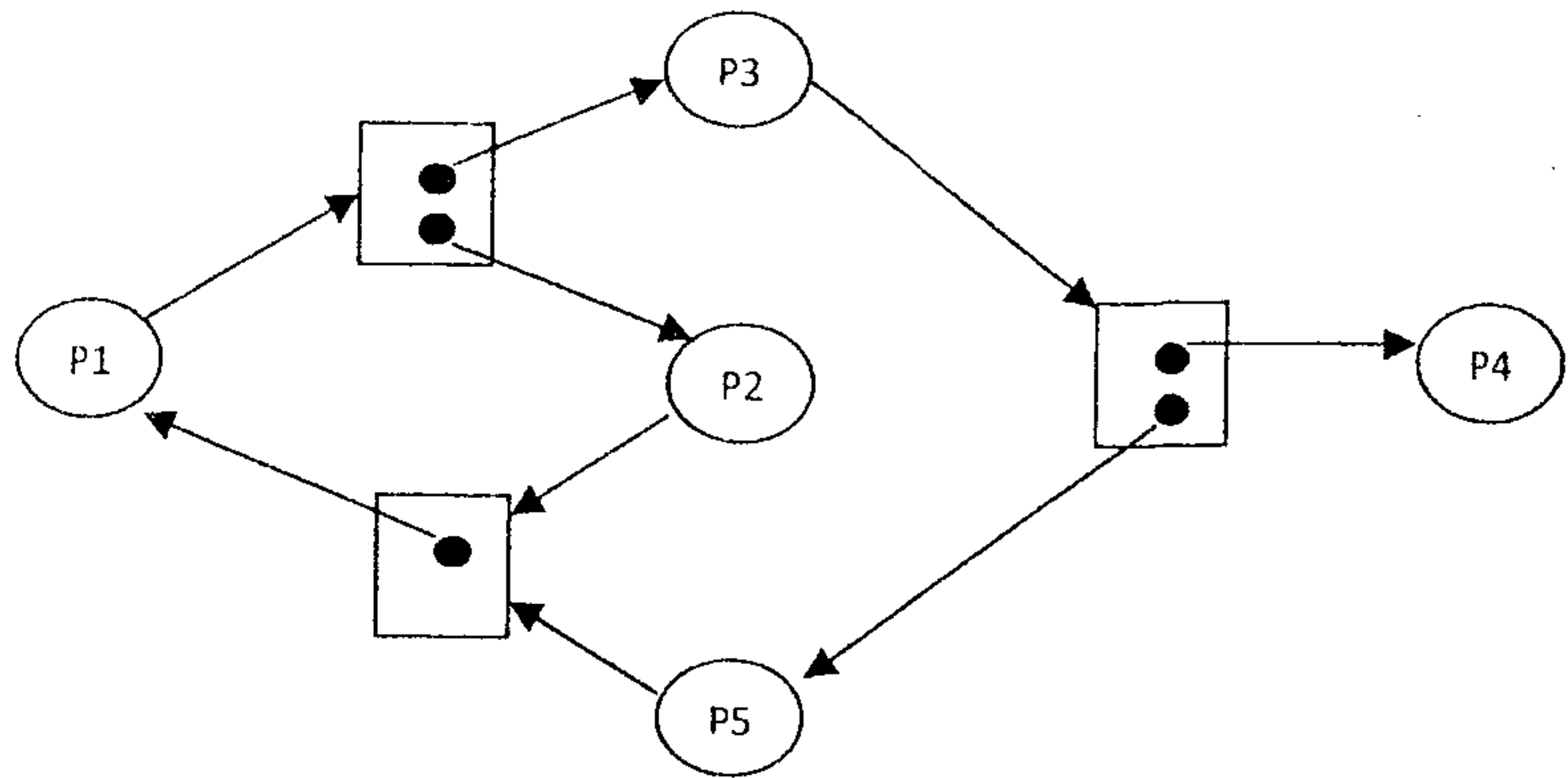
$P_0(4,3,8,3,0)$ ,  $P_1(4,3,8,3,2)$ ,  $P_2(1,7,1,2,0)$ ,  $P_3(4,4,6,1,0)$ ,  $P_4(4,9,8,3,0)$

Find the order of preemption of these processes to recover the system from deadlock.

(2 Marks)

- 3) a) Consider 4 CPU intensive processes which require 6, 10, 3, 15 time units and arrive at 0, 2, 5, 6 respectively. How many context switches are needed if it is implemented by SRTN (shortest remaining time next) and RR (round robin – quantum size 5). (Do not context switch at time 0 and at the end). Form a Gantt chart and calculate average waiting time, average turnaround time and response time using SRTN and RR. (3 Marks)
- b) Consider a asset of n tasks with known runtime  $r_1, r_2, \dots, r_n$  to be run on a uniprocessor machine. Suggest a scheduling algorithm which will result in maximum throughput. Justify your choice. (2 Marks)

4) a)



Is the system represented in the above resource allocation graph deadlocked? Why/Why not? (2 Marks)

b) Assume we have the following resources:

- 5 tape drives
- 2 graphic displays
- 4 printers
- 3 disks

Consider we have already allocated these 4 resources among 4 processes as:

Process	Tape Drives	Graphic Displays	Printers	Disks
A	2	0	1	1
B	0	1	0	0
C	1	0	1	1
D	1	1	0	1

The no. of resources still needed by each process is:

Process	Tape Drives	Graphic Displays	Printers	Disks
A	1	1	0	0
B	0	1	1	2
C	3	1	0	0
D	0	0	1	0

- Will the system reach a deadlock state?
- Process C makes a request (1,0,1,0). Can it be granted? Why/Why not?
- Discuss any 2 disadvantages of Banker's Algorithm. (1+1+1 Marks)

5) a) Describe various services provided by Operating Systems. (3 Marks)

b) Suggest a multithreading model which will best suit each of the following scenarios:

- Fighter Plane (requesting to hit the target)
- Embedded System (in a washing machine) (2 Marks)

6) Write short notes on:

- Virtual Machines
- Race Condition
- Critical Section
- IPC

(1+1+1+2 Marks)