



Semester: 5th
Sub & Code: OS, CS-3009
Branch (s): CSE, IT, CSSE, CSCE, ECS

AUTUMN MID SEMESTER EXAMINATION-2019

School of Computer Engineering
KIIT Deemed to be University, Bhubaneswar-751024
Operating Systems
[CS3009]

Time: 1 1/2 Hours

Full Mark: 20

*Answer any four Questions including Q.No.1 which is Compulsory.
The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.*

1. Answer all questions.

[1×5]

- What resources are used when a thread is created? How do they differ from those used when a process is created?
- What is the necessity of context switching? Why is it considered as an overhead for the system?
- Consider following concurrent processes P0 and P1 using an integer shared variable $i=10$.

```
P0
begin
    A
    i++;
    printf("%d", i);
end
```

```
P1
begin
    printf("%d", i);
    B
end
```

Write the code for **A** and **B** using wait() and signal() operations such that output will be 10 11. (i.e. 10 will be printed prior to 11)

- Suppose a short term scheduler uses an algorithm that selects processes which have used least processor time in recent past. Justify that the algorithm favors I/O bound processes without starvation to CPU bound processes.
- A system has 10 identical resources and N processes competing for them. Each process can request at most 2 resources. Find the minimum value of N for which the system may lead to deadlock.

2. Consider the following set of processes arrive in a system. [5]

Process #	CPU burst time	Priority	Arrival Time
P1	8	4	0
P2	6	1	1
P3	1	2	3
P4	9	2	6

Show the order of execution and calculate the Response time, Waiting time of the processes for the following scheduling algorithms.

- FCFS
 - RR (quantum = 3 ms)
 - Preemptive priority scheduling. (Note: consider lowest number as highest priority)
3. a) What are the various states of a process? Show and explain the transitions of states of a process by means of a diagram. [3]
- b) Consider three concurrent processes as P0, P1 and P2 and three semaphore variables as S0, S1 and S2. The semaphores are initialized as S0=1, S1=0 and S2=0. [2]

P0	P1	P2
do{ printf("0"); printf("0") }while(1);	do{ printf("2"); printf("2") }while(1);	do{ printf("1"); printf("1") }while(1);

Use wait() and signal() operations on the semaphore variables in the above processes such that the following string will be printed. Justify your solution.
002211002211.....

4. a) Consider a producer/consumer problem with a bounded buffer of size 10. Write a semaphore based solution to the problem with a condition that the consumer always retrieves the oldest item. [3]
- b) Show that, if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated. [2]
5. a) Consider the set of 5 processes whose arrival time and burst time are given below. [3]

Process id	Arrival time	Burst time
P1	0	3
P2	1	5
P3	2	1
P4	2	4
P5	4	5

If the CPU scheduling policy is FCFS and context switching time is 1 time unit, then,

- Find the CPU utilization.
 - What will be the CPU Utilization in case the context switching time is 2 time units? (Hint: CPU Utilization is the percentage of time the CPU is busy in execution)
- b) What are the conditions for deadlock? How can the operating system prevent deadlock? [2]