

Mid-Semester Examination
School of Computer Engineering
KIIT University, Bhubaneswar-24

Q1) Answer all questions.

[1×5]

(a) Why the FCFS scheduling is always non preemptive type?

Evaluation Scheme

Since a later coming process cannot better satisfy the scheduler criteria. _____ 1 mark

(b) Two processes P_0 and P_1 , share the following variables:

```
boolean key;
boolean lock ; /* initially false */
```

Structure of the processes is given below:

```
do {
key = True;
while(key == True)
{
Swap(&lock, &key);
}
// critical section
lock = True;
// remainder section
} while(True);
```

The Swap() is as follows:

```
void Swap(boolean *a, boolean *b)
{
boolean x = *a;
*a = *b;
*b = x;
}
```

Whether the above mentioned algorithm ensure mutual exclusion requirement? Justify.

Evaluation Scheme

No: only one process will be able to enter the critical section only once: _____ 1 mark

(c) What are the benefits of threads over processes?

Evaluation Scheme

Benefits--context switching, creation _____ 1 mark

(d) If Round Robin is used with a time quantum of 2 seconds, what will be the turnaround time for the process P_2 ?

Process	Next CPU Burst Time
P_1	9 min

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P2	1 sec
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Evaluation Scheme

Assuming execution sequence $P1 \rightarrow P2$: turn around time of $P2 = 3\text{sec}$ _____ 1 mark

(e) What is aging priority? Why is it used?

Evaluation Scheme

To avoid starvation: _____ 0.5 mark

Explanation _____ 0.5 mark

Q2) (a) Compare among different schedulers that can exist in an operating system? [2.5]

Evaluation Scheme

Marks to be awarded based on explanation on short term, long term and middle term schedulers.

(b) Consider the following snapshot of the system: [2.5]

Process	Next CPU Burst Time(ms)	Arrival Time
P1	10	0
P2	5	1
P3	2	2
P4	1	3

Using shortest remaining time first scheduling, find the waiting time of each process.

Evaluation Scheme

Order of Execution:

$P1 \rightarrow P2 \rightarrow P3 \rightarrow P4 \rightarrow P2 \rightarrow P1$

Waiting time

$P1 = 0 + 8 = 8$

$P2 = 0 + 3 = 3$

$P3 = 0$

$P4 = 1$

Marks to be awarded by looking into the correctness in order of execution _____ 1.5 mark

calculation of waiting time _____ 1 mark

Evaluation Scheme

Q3) What are the various states of a process? Explain about the state transitions of a process during its life. [5]

Explanation of different states like new, ready, running, waiting, terminate _____ 2.5 marks

State transition diagram and explanation _____ 2.5 marks

Q4) What are the conditions for a solution to critical section problem? Design a solution to critical section problem involving 2-processes. Justify that the solution is satisfying the conditions. [5]

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Evaluation Scheme

Explanation of conditions like mutual exclusion, progress & bounded waiting: _____ 2 marks
2-process solution _____ 1 mark
Justification for the solution _____ 2 marks

Q5) Consider the following processes arrived in a system.

[5]

Process	Next CPU Burst Time(ms)	Arrival Time
A		
B	4	0
C	5	1
D	6	2
E	3	3
F	1	4
	4	5

Calculate the average waiting time of the processes if the scheduling algorithm is Round Robin with time slice length as 2 ms.

Evaluation Scheme

Execution sequence: A->B->C->A->D->E->B->F->C->D->B->F->C

Waiting Time in ms:

$$A=0+4=4$$

$$B=1+7+5=13$$

$$C=2+9+4=15$$

$$D=5+7=12$$

$$E=6$$

$$F=8+4=12$$

$$\text{Average waiting time} = 62/6 = 10.33 \text{ ms}$$

Execution sequence and ready queue sequence _____ 2.5 marks
Waiting Time calculation _____ 2.5 marks

Q6) What is busy waiting? How a semaphore can be implemented to have no busy waiting?

[5]

Evaluation Scheme

Explanation of busy waiting _____ 2 marks
Structure implementation _____ 2 marks
Explanation _____ 1 mark

Q7) Explain Dining philosopher problem. Develop a deadlock free semaphore based solution to solve the dining philosopher problem. Whether the solution is free from starvation?

[5]

Evaluation Scheme

Dining philosopher problem: Definition _____ 1 mark
Semaphore based solution _____ 2 marks
Deadlock free solution _____ 2 marks

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