POSSESION OF MOBILES IN EXAM IS UFM PRACTICE.

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Jaypee Institute of Information Technology, Noida
T1 Examination, 2022
B.Tech 5th Semester

Course Title : Operating system and system programming **Maximum Time : 1 Hour**
Course Code : 15B11CI412 **Maximum Marks : 20**

C311.1	Describe and explain the fundamental componets of opearing system and system programminng
C311.2	Apply and compare various policies of scheduling in processes and threads in OS.
C311.3	Describe and discuss various resource managment techniques of opearing sytem and compare their performance.
C311.4	Understand the concept of IPC and describe various process synchronization techniques in OS.
C311.5	Discuss the working of IO managment and apply various disk scheduling techniques.
C311.6	Analyze and report appropriate OS design choices when building real world system.

1. Write differences between the following **[3 Marks][CO-1].**
   a) System call vs user define function
   b) Monolithic vs Microkernel Operating System
   c) Parallel Computing system vs Distributed system.
2. Given the following 5 Process, A multilevel feedback queue scheduling algorithm is used. There are 3 queues with the highest priority queue Q1 use **round robin** with a time quantum of **8 ms**. Q2 uses **round robin** having time quantum of **12ms** . Lowes priority queue Q3 uses **SJF** for scheduling. **[5 Marks][CO-2]**

Process	Arrival Time	CPU Burst Time
P1	0	12
P2	5	45
P3	24	3
P4	30	22
P5	33	32

   a) Draw Gantt Chart for CPU scheduling
   b) What is the the **average waiting and turnaround time** ?
   c) How many times process P2 will be interrupted and which queue the process will terminated the execution ?
3. Consider a multiprocessor system and a multithreaded program written using the many to many threading model. Let the number of user level thread in the program be more than the number of processors in the system. Discuss the performance implication of the following scenarios. **[4 Marks][CO-2]**
   a) The number of kernel threads allocated to the program is less than the number of processors.
   b) The number of kernel threads allocated to the program is equal to the number of processors
   c) The number of kernel threads allocated to the program is greater than the number of processors but less than the number of user level threads.
4. Consider the following set of processes, with the arrival times, I/O burst time(I/O is overlapping), and the CPU burst time given in milliseconds. The pre-emptive shortest remaining time first algorithm will be used to schedule the process. **[4 Marks] [CO-2].**

Processes	Arrival Time	CPU Burst Time-1	I/O Burst Time	CPU Burst Time -2
P1	0	3	2	2
P2	0	2	4	1
P3	2	1	3	2
P4	5	2	2	1

Find the following

a) Draw Gantt Chart
b) Waiting time of each process and average waiting time.
c) Turnaround time of each process and average turnaround time.

5. What will be the output of the following program ?Justify your answer with a proper explanation.**[4 Marks][CO-2]**

a)

```
#include <stdio.h>
#include<unistd.h>
int main()
{
            if(fork() && fork())
                    fork();
            printf("hello");
            return 0;
}
```

b)

```
#include<pthread.h>
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
# define MAX_THREADS    50
pthread_t thread_id [MAX_THREADS];
Void * printHello(void * data)
{
printf("hello from thread %u - I was created in iterating %d ! \n",
(int)pthread_self(),(int)data);
pthread_exit(NULL);
 }
int main()
{
int rc,i,n;
n=20;
for(i=0;i<n;i++)
{
rc=pthread_create(&thread_id[i],NULL,printHello,(void *)i);
if(rc)
{
printf("\n ERROR %d \n",rc);
exit(1);
}
printf("\n I am thread %u created new thread (%u) in iterating %d.....\n",(int)
pthread_self(),(int) thread_id[i],i);
If(i % 5 == 0) sleep(1);
}
pthread_exit(NULL);
}
```

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T1 SOLUTION

1. **[1 MARK EACH]**

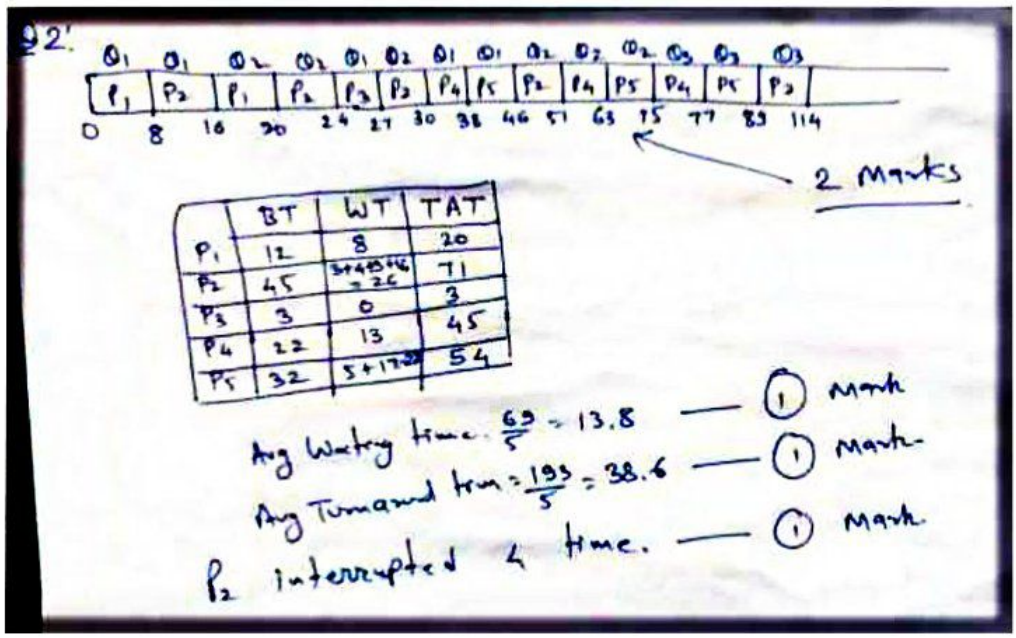
a) A system call differs from a user function in several key ways.

- A system call has more privilege than a normal subroutine. A system call runs with kernel-mode privilege in the kernel protection domain.
- System call code and data are located in global kernel memory.
- System calls cannot use shared libraries or any symbols not found in the kernel protection domain.

b) A microkernel is a kernel type that implements an operating system by providing methods, including low-level address space management, IPC, and thread management. On the other hand, a monolithic kernel is a type of kernel in which the complete OS runs in the kernel space.

c) Parallel Computing:
In parallel computing multiple processors performs multiple tasks assigned to them simultaneously. Memory in parallel systems can either be shared or distributed. Parallel computing provides concurrency and saves time and money.
Distributed Computing:
In distributed computing we have multiple autonomous computers which seems to the user as single system. In distributed systems there is no shared memory and computers communicate with each other through message passing. In distributed computing a single task is divided among different computers.

2. [2 MARKS + 2 MARKS + 1 MARK]



P2 is interrupted 4 times and ends in Q3.

3. [1.5 MARKS+1 MARK+1.5 MARKS]

a) The number of kernel threads allocated to the program is less than the number of processors.

The scheduler can only schedule user level processes to the kernel threads, and since some of the processes are not mapped to the kernel threads, they will be idle.

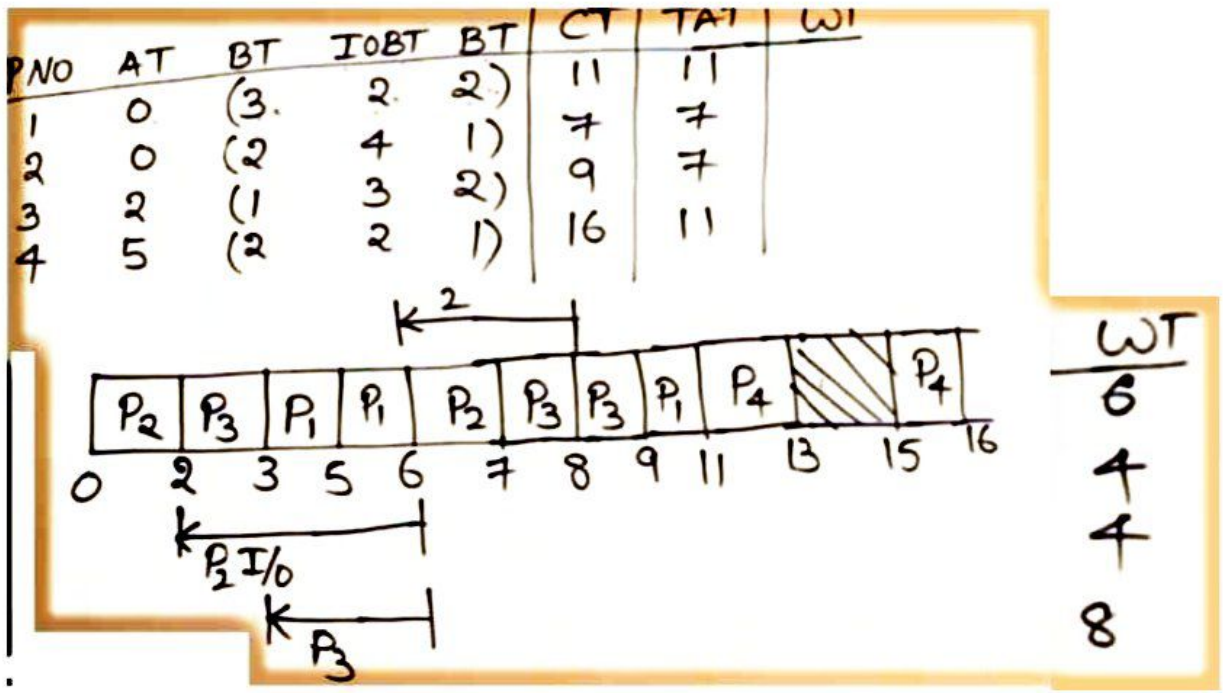
b) The number of kernel threads allocated to the program is equal to the number of processors.

All the processors will be busy and properly utilized with all kernel threads running.

c) The number of kernel threads allocated to the program is greater than the number of processors but less than the number of user level threads

All of the processes will be working simultaneously assuming there are enough user threads. If a kernel thread is blocked, it may be swapped out for one that isn't blocked.

4.



Average Waiting Time =(6+4+4+8) / 4 = 22 / 4 = 5.5

Average Turnaround Time=(11+7+7+11)/4 =36/4= 9

5. What will be the output of the following program? Justify your answer with proper explanations.

[1 MARK FOR OUTPUT AND 1 MARK FOR JUSTIFICATION]

```
hellohellohellohello
```

a)

b) the program that will create 20 threads .

each of which prints out a hello message and its own thread ID.

Also, make the main thread sleep for 1 second for every 4 or 5 threads it creates and show how the execution of the threads interleaves.