ONE ANSWER (the best answer).

Copy your answer for question 1-1 to 1-12 in the table on page 3. ONLY THAT TABLE WILL BE GRADED. (Your answer should be one of the letters A, B, C or D)

1.	**The _____ of a process contains temporary data such as function parameters, return addresses, and local variables.**
A	text section
B	data section
C	heap
D	stack

2.	**When a process requests I/O, its state is changed to**
A	running
B	waiting
C	ready
D	terminated

3.	**When a parent process forks a child process, the child's data section:**
A	will be empty and shared with the parent process.
B	is copied from the parent process and shared with it.
C	is copied from the parent process, but NOT shared with it.
D	will be empty, and NOT shared with the parent process.

4.	**If a parent did not invoke wait() and instead terminated, its child processes becomes**
A	a zombie process.
B	an orphan process.
C	a terminated process.
D	None of the above.

5.	**Nowadays, kernel generally**
A	consists of processes but no threading is required.
B	does not used threads at all.
C	is single-threaded.
D	is multithreaded.

6.	**When fork() is used for multithreaded process, the following will occur:**
A	duplicate only the calling thread.
B	duplicate all threads.
C	A or B, depending on the version of fork used.
D	All the above are possible.

7.	**In case a programmer requires each thread to have its own global variables, the programmer can use**
A	Thread-local storage (TLS)
B	data section
C	local variables
D	code section

8.	**_____ provides programmer with API for creating and managing threads.**
A	Multicore system
B	Thread library
C	System call
D	Concurrency and parallelism

9.	**Which module gives control of the CPU to the process selected by the short-term scheduler?**
A	dispatcher
B	interrupt
C	scheduler
D	none of the mentioned

10.	**The processes that are residing in main memory and are ready and waiting to execute are kept on a list called:**
A	job queue
B	ready queue
C	execution queue
D	process queue

11.	**Processes are classified into different groups in:**
A	shortest job scheduling algorithm
B	round robin scheduling algorithm
C	priority scheduling algorithm
D	multilevel queue scheduling algorithm

12.	**Time quantum is defined in:**
A	shortest job scheduling algorithm
B	round robin scheduling algorithm
C	priority scheduling algorithm
D	multilevel queue scheduling algorithm

Your Answer should be written in the following table:

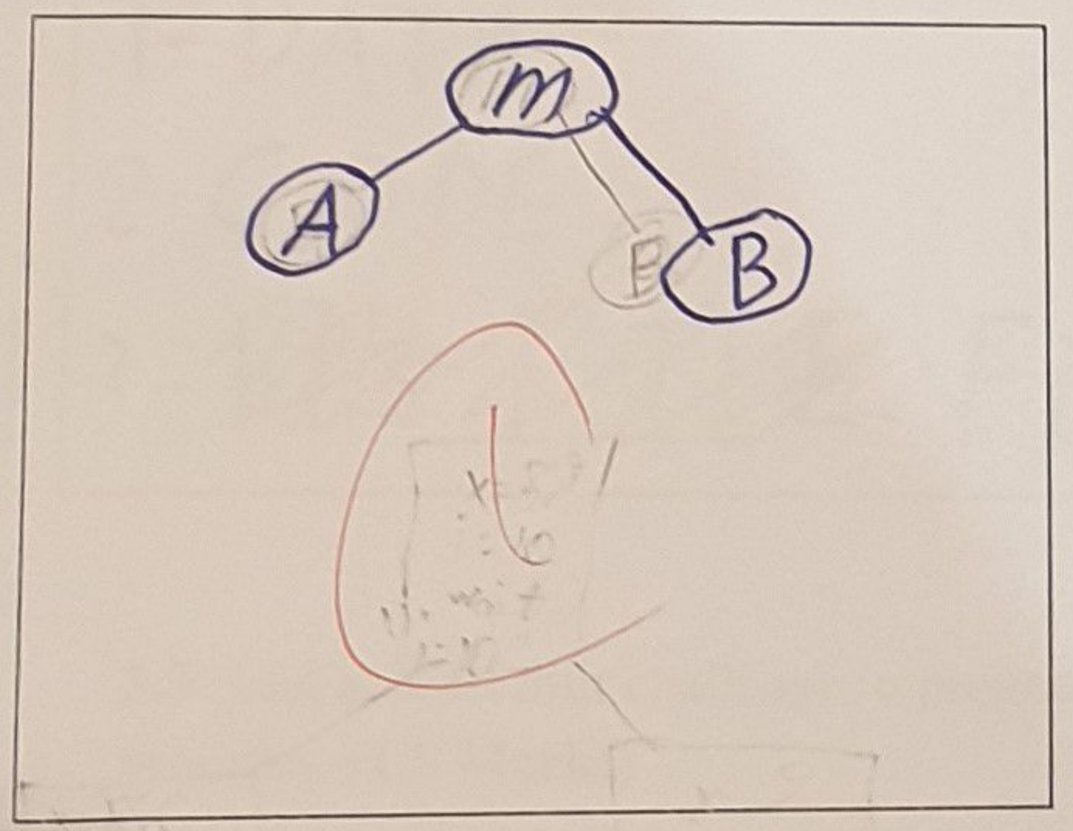
1.	2.	3.	4.	5.	6.
D	B	C	B	B D	B D
7.	**8.**	**9.**	**10.**	**11.**	**12.**
A	B	A	B	D	B

Question 2. (4 Marks)

Consider the following C program:

```
#include<stdio.h>
#include<unistd.h>
int i;
int main() {
    int x=5;
    i=10;
    if (fork()==0) {
      i=i*2; x=x+1;
      printf("x=%d \n", x);
    } else {
        x=x+4;
        wait(NULL);
        printf("i=%d \n", i);
        fork ();
        printf("x=%d \n", x);
    }
}
```

2.1 Draw the process tree of this program. **(1 Mark)**



2.2 What is the output of this program? **(1 Mark)**

x=6
i=10
x=9
x=4

2.3 Considering the parent process, in which section will the following be stored? **(1 Mark)**

The variable i: ...data.....
The variable x: ...Stack.....

2.4 True or False: **(1 Mark)**

- The parent process will never be in a waiting state. [False]
- The first child will never be in a waiting state. [True]

Student's Name: .....

Student's ID: .....

Question 3. (4 Marks)

4

3.1 Assume there is an array of ten million entries, and you are required to calculate the sum of these entries. Describe an efficient way to perform this task. **(1.5 Marks)**.

I will calculate it using multythriding so I will devide the array let say I have the hardware to do it. I will divide the array to 20 Part each Part have 500000 entries and I put each Part in thread and let it calculate the sum of this Part and I will do the same to each Part after that I will take the sum of the Parts

3.2 When having multithreaded process, some sections of the Process Control Block (PCB) are shared, list them. **(1.5 Marks)**.

1- DATA
2- CODE
3- File

1.5

3.3 List at least four challenges a programmer might face while writing multithreaded program. **(1.5 Marks)**

X

1- for K() and exec() different implementation in OS
2- the dependency
3- testing and debuging
4- activity dividing
5- Balance

Student's ID: .....

Question 4. **(6 Marks)**

4.1 Define the difference between preemptive and nonpreemptive scheduling. **(1 Mark).**

Answer:

Preemptive scheduling:

it mean that if Process went in running Queue It will continue until it finsh even if there is another have more Priority that that Process

Nonpreemptive scheduling:

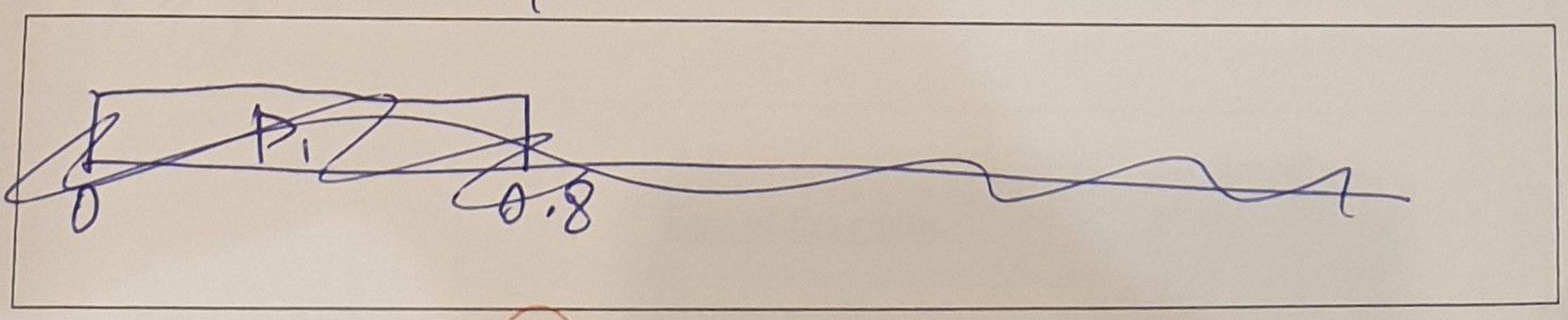
it mean that it's Possiable that it's to stop Process in running queue and put it in ready queue because their is Process have more Priority than that Process

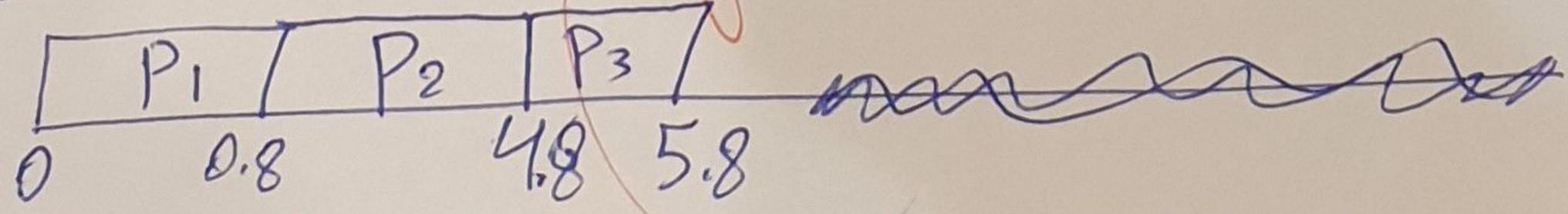
4.2 Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time. In answering the questions, use **nonpreemptive** scheduling and base all decisions on the information you have at the time the decision must be made.

Process	Arrival Time	Burst Time
P1	0.0	0.8
P2	0.4	4.0
P3	1.0	1.0

4.2.1 Draw the Gantt Chat and give the average turnaround time for these processes with the FCFS scheduling algorithm?

Gantt Chart (1 Mark):



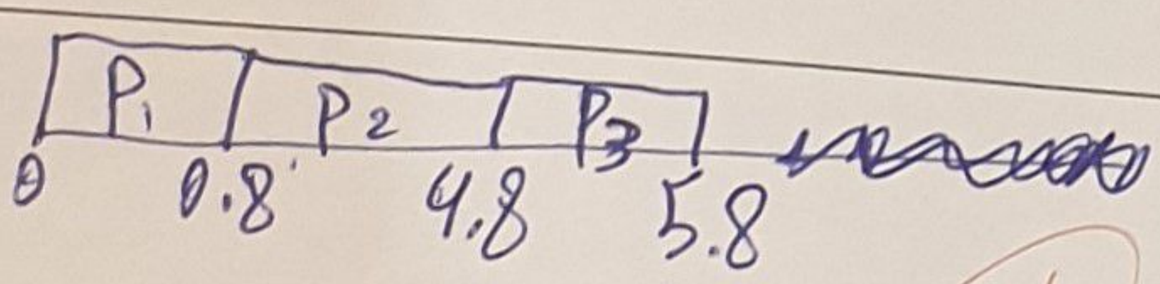


Average turnaround time for these processes (2 Mark):

$T(P_1) = 0.8 - 0 = 0.8$
$T(P_2) = 4.8 - 0.4 = 4.4$
$T(P_3) = 5.8 - 1 = 4.8$
$\text{average} = \frac{0.8 + 4.4 + 4.8}{3} = \frac{10}{3} = 3.333 ms$

4.2.2 Draw the Gantt Chat and give the average turnaround time for these processes with the SJF scheduling algorithm? **(2 Marks)**

Gantt Chart: (1 Mark):



Average turnaround time for these processes: (1 Mark):

$T(P_1) = 0.8$
$T(P_2) = 4.4$
$T(P_3) = 4.8$

$\frac{0.8 + 4.4 + 4.8}{3} = \frac{10}{3} = 3.333 ms$

End of the exam.