

**CSE231 Operating System, Quiz 02 Monsoon 2024**  
**Time allocated: 4pm – 4:20pm**

<b>Name</b>	
<b>Roll Number</b>	

**Instructions:**

- This is a closed book and closed notes quiz. Please be aware of strict plagiarism policy.
- For questions requiring justification, please be as concise as possible. 2-3 sentences would be the ideal size of a justification. No extra pages will be provided.

**Question 1:** For the program shown in Figure-1, how many entries (total number of elements) will be there in each of the process queues (ready, waiting, and running) **immediately** after all the processes are launched in the program on two different systems A and B? System A has a dual core processor whereas system B has a quad core processor. Assume that there are only these three queues in the OS process scheduler. You have to consider the entries in these queues specific to processes from this program only. Assume there are no other processes in these queues. **[3 marks]**

System A (dual core)	Ready	Waiting	Running
	<b>3</b>	<b>6</b>	<b>2</b>
System B (quad core)	Ready	Waiting	Running
	<b>1</b>	<b>6</b>	<b>4</b>

```
for (int i=0; i<10; i++) {  
    if(fork()==0) {  
        if(i%2 == 0) sleep(10);  
        else calculate_fib(100);  
        exit(0);  
    }  
}  
wait(NULL);
```

**Figure 1**

**Note that it is clearly mentioned in the question: “immediately after all the processes are launched in the program”**

**Marking scheme: 0.5x6 = 3 marks**

**Question 2:** Standard C library provides wrapper APIs for system calls. These APIs are there to improve the performance of the system call. True/False? **Justify with two reasons. [1.5 marks]**

**Answer:** False. (a) They improve productivity by providing a simple to use interface, (b) support portability across other OS versions, (c) helps in error handling.

**Marks only for correct reasoning: 0.5 (True/False) + 0.5x2 = 1.5 marks**

**Question 3:** (a) What is the name of the signal sent by a child process to its parent after calling exit system call? (b) What happens by default if the parent received the signal while it was busy calculating Fibonacci number 40? (c) What would happen to child after it terminates in the scenario mentioned in point-b? **[1.5 marks]**

**Answer:**

(a) SIGCHLD, (b) Signal is ignored, (c) Child will become zombie.

**Marking: 0.5 x 3**

**Question 4:** To answer this question, you must consider the existence of the Shell process (**P1**). For the command “cat file.txt | grep Henry | wc -l”: a) identify the created processes and its associated job (you can use process names as P2, P3, etc., etc.), b) identify the parent child relationships, c) identify which processes will be using the read and write end of the respective pipes. **[2 marks]**

**Answer:**

(a) **[0.5 marks only if each one correctly mentioned]**

P2 -> cat file.txt

P3 -> grep Henry

P4 -> wc -l

(b) **[0.5 marks only if each one correctly mentioned]**

P1 parent of P2, P3, and P4

(c)

P2 will use the write end of Pipe-1 and P3 will use the read end of Pipe-1 **[0.5 marks]**

P3 will use the write end of Pipe-2 and P4 will use the read end of Pipe-2 **[0.5 marks]**

**Question 5:** The following events are related to each other when a certain action is taken by the user application. Arrange them in the order they are accessed/occurred (no justification required):

(a) Kernel stack (b) store in EAX, (c) IDTR, (d) Pop Register, (e) User stack, (f) Trap, (g) Save Registers, (h) IDT, (i) unistd.h, (j) load from EAX **[2 marks]**.

**Answer:**

User Stack

Trap

Unistd.h

Store in EAX

IDTR

IDT

Kernel stack

Save Registers

Load from EAX

Pop register

OR

Trap

Unistd.h

Store in EAX

IDTR

IDT

Kernel stack

Save Registers

Load from EAX

Pop register

User Stack

**[Marking scheme: 0.2x10=2 marks]**