Mahindra University Hyderabad

École Centrale School of Engineering

Minor-I

Program: B. Tech. **Year: 3** **Semester: 1**

Subject: Operating Systems (CS/AI3102)

Date: 16 Sep 2023 **Start Time: 10:00 AM**

Time Duration: 1.5 hours **Max. Marks: 40**

Instructions

1. No marks will be given without proper justifications.
2. Do not use a pencil for writing your answers.

Q1. Assess the validity (True/False) of these operating-system-related statements, and provide justifications for your answers. $(5\times1 = 5\ marks)$

A) Increasing the degree of multiprogramming always increases the throughput.

B) A process in user mode cannot execute certain privileged hardware instructions.

C) Two processes that are not parent-child can concurrently execute the same program?

D) A C-program cannot directly invoke the OS system calls and must always use the C library for this purpose.

E) While fetch-decode-execute, the CPU retrieves instructions from the hard disk.

Q2. While executing the 'printf' function call execution on a typical processor, explain the steps of how the processor switches between: $(2.5\times2 = 5\ marks)$

A) user mode to privileged mode

B) privileged mode to user mode

Q3. Consider the following C program. Assume there are no syntax errors and the program executes correctly. Assume the fork system calls succeed. What is the output printed to the screen when we execute the below program? $(10\ marks)$

```
void main(argc, argv) {
      for(int i = 0; i < 4; i++) {
            int ret = fork();
            if(ret == 0)
            printf("child %d\n", i); } }
```

Q4. Briefly explain the purpose of following shell commands. $(2.5\times4 = 10\ marks)$

A) chmod

B) ls

C) whereami

D) hello=`whoami` & echo hello $hello

Q5. Consider the following three processes that arrive in a system at the specified times, along with the duration of their CPU bursts. Process P1 arrives at time t=0, and has a CPU burst of 10 time units. P2 arrives at t=2, and has a CPU burst of 2 units. P3 arrives at t=3, and has a CPU burst of 3 units. Assume that the processes execute only once for the duration of their CPU burst, and terminate immediately. Calculate the time of completion of the three processes under each of the following scheduling policies. For each policy, you must state the completion time of all three processes, P1, P2, and P3. Assume there are no other processes in the scheduler's queue. For the preemptive policies, assume that a running process can be immediately preempted as soon as the new process arrives (if the policy should decide to preempt). (Explain using Gantt chart)

A) First Come First Serve $(2.5\ marks)$

B) Shortest Job First (non-preemptive) $(2.5\ marks)$

C) Shortest Remaining Time First (preemptive) $(5\ marks)$