Information Technology University of the Punjab
SE301T Operating Systems A – Spring 2025
Quiz 1 [CLO1] – February 24, 2025

Name: _____Solution_____ **Roll No.: _____**
Time allowed: 40 minutes **Maximum Marks:** 25

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1. Suppose that the PID of parent process (the first process) is 10 and each new process is assigned a PID 1 higher than the previously assigned PID. What will be printed by the following lines of code? [4]

```
int main() {
    int rc = fork();
    if (rc == 0)
        printf("A: %d\n",getpid());
    if (rc > 0){
        wait(NULL);
        rc = fork();
        wait(NULL);
        printf("B: %d\n", rc);
    }
    printf("C: %d\n", getpid());
}
```

A: 11
C: 11
B: 0
C: 12
B: 12
C: 10

2. What is meant by a context switch? [2]
The process by which the OS switches to another process is called the context switch. It involves saving the state of the current running process and restoring the process of the new process to run.

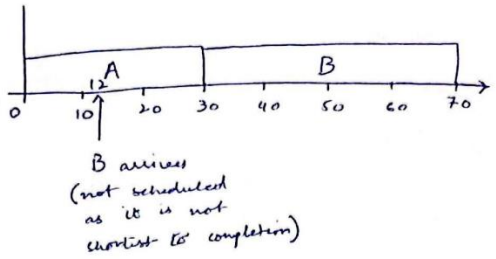
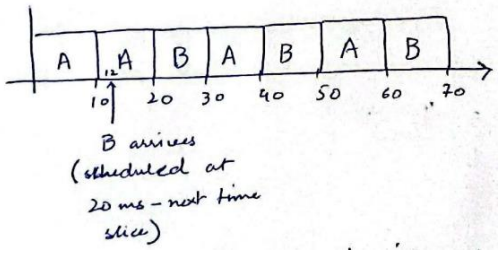
3. Write code that uses a pipe to send a message "Hello I am your parent\n" from the parent to the child. [4]

```
int main() {
   int fd[2];
   char buffer[100];
   pipe(fd);
   int rc = fork();

   if (rc == 0) {                                    // Child process
      close(fd[1]);                                  // Close write end
      read(fd[0], buffer, sizeof(buffer));           // Read from pipe
      close(fd[0]);                                  // Close read end
   } else {                                          // Parent process
      close(fd[0]);                                  // Close read end
      write(fd[1], "Hello, I am your parent!", 24);  // Write to pipe
      close(fd[1]);                                  // Close write end
   }

   return 0;
}
```

4. Show with the help of a hypothetical workload (with at least two processes whose runtimes are known) that the shortest to completion first algorithm performs badly at response time compared to round robin and round robin performs poorly in turnaround time. [4]

Consider the following two processes:

Process	Arrival time	Total runtime
A	0	30
B	12	40

STCF	**Round robin**
	
$Turnaround\ time = \frac{(30-0)+(70-12)}{2} = 44$	$Turnaround\ time = \frac{(60-0)+(70-12)}{2} = 59$
$Response\ time = \frac{(0-0)+(30-12)}{2} = 9$	$Response\ time = \frac{(0-0)+(20-12)}{2} = 4$

5. For what kinds of jobs do the response time and the turnaround time matter respectively? [3]

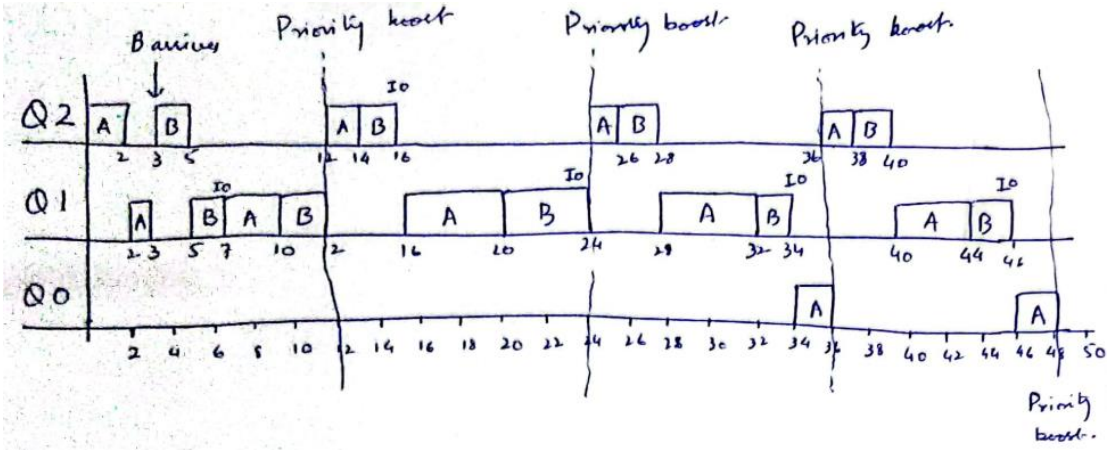
Jobs that are interactive need to perform better with respect to response time and jobs that are CPU intensive need to perform better with respect to the turnaround time.

6. How are processes that generate I/Os handled in round robin scheduling? [2]

When a process (job) generate I/O, its remaining part is considered as a subjob, so that during the I/O, another job may be scheduled and CPU is not kept waiting. After the I/O completes, the job is made RUNNABLE and can be picked by the OS to run in a time slice.

7. For the following workload, draw the timing diagram for an MLFQ scheduler that has three priority queues Q0, Q1 and Q2 with Q2 being the highest priority queue. Q1 and Q2 have allotment times of 4 ms and 2 ms respectively. Also suppose that the scheduler boosts the priorities of all processes after every 12 ms. [6]

Job	**Arrival time**	**Total runtime**	**I/Os**
A	0	30	Does not generate any I/O
B	3	20	2 ms I/O after every 4 ms



(Note: The timing diagram does not cover the complete runtimes of the processes, however, full marks are to be awarded to a student who has shown correct scheduling at least up till the second priority boost)