## First Question

### Essay Questions

1. Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs? (2 Marks)
2. What is the cause of thrashing? How does the system detect thrashing? (2 Marks)
3. Assume that a program has just referenced an address in virtual memory. Describe a scenario in which each of the following can occur. (If no such scenario can occur, explain why). (4 Marks)
   - a. TLB miss with no page fault
   - b. TLB miss and page fault
   - c. TLB hit and no page fault
   - d. TLB hit and page fault?

4. Explain the differences in how much the following scheduling algorithms discriminate in favor of short processes: (4 Marks)
   - a. FCFS
   - b. RR

5. Briefly describe the three types of processor scheduling? (3 Marks)

6. What is the difference between logical I/O and device I/O? (2 Marks)

7. What is the difference between block-oriented devices and stream-oriented devices? Give a few examples of each. (3 Marks)

## Second Question

### Question 2 B1

Consider the following page reference string:

```
1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.
```

How many page faults would occur for the following replacement algorithms, assuming four frames?

Remember that all frames are initially empty, so your first unique pages will cost one fault each.

1) LRU replacement
2) FIFO replacement
3) Optimal replacement
Consider the following set of processes, with the length of the CPU burst given in milliseconds:

<table>
<thead>
<tr>
<th>Process</th>
<th>Burst Time</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_1$</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>$P_2$</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$P_3$</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>$P_4$</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>$P_5$</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

The processes are assumed to have arrived in the order $P_1$, $P_2$, $P_3$, $P_4$, $P_5$, all at time 0.

1) Draw 3 Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: SJF, HRR, and RR (quantum= 2).

2) What is the turnaround time and response of each process for each of the scheduling algorithms in part 1?

Illustrate the movement of the disk read/write head and show the average seek length for the following sequence of disk track requests using SSTF, SCAN algorithms:

27, 129, 110, 186, 147, 41, 10, 64, 120.

Assume that the disk head is initially positioned over track 100 and is moving in the direction of decreasing track number.
NOTE:
This Section is for Students who have not attended Mid Term Exam  
( 20 Marks)

1) What are the steps performed by an OS to create a new process? (4 Marks)

2) What is the difference between process and thread? Show the advantages of threads over process? (4 Marks)

3) Show how each of the techniques of prevention and avoidance can be applied to the following Figure? (6 Marks)

4) Consider a system with a total of 150 units of memory, allocated to three processes as shown:

<table>
<thead>
<tr>
<th>Process</th>
<th>Max</th>
<th>Hold</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>

If a fourth process arrives, with a maximum memory need of 60 and an initial need of 35 units Would it be safe to grant this requests. Why? or why not? (6 Marks)

End of Questions
Good Luck