

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2023****Subject Code:3140702****Date:11-01-2024****Subject Name: Operating System****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	Marks
<b>Q.1</b> (a) Define true virtualization with example.	<b>03</b>
(b) Write a shell script to find factorial of an user-defined natural number.	<b>04</b>
(c) Draw and explain <b>seven state</b> process state transition diagram in detail.	<b>07</b>
<b>Q.2</b> (a) Explain the main function of a dispatcher in brief.	<b>03</b>
(b) List and briefly define four classes of real-time scheduling algorithms.	<b>04</b>
(c) Five batch jobs A, B, C, D and E arrive at same time. They have estimated running times 10, 6, 3, 4 and 8 ms. For each of the following algorithm determine mean process turnaround time. Consider process swapping overhead is 1 ms.	<b>07</b>
1) FCFS	
2) Round-Robin (Time quantum = 2 ms)	
<b>OR</b>	
(c) Five batch jobs P1, P2, P3, P4 and P5 arrive at 0, 1, 2, 3 and 4 ms. They have estimated running times 14, 12, 8, 3 and 6 ms. Their priorities are 3, 5, 2, 1 and 4 respectively with 5 being highest priority. For each of the following algorithm determine mean process turnaround time. Consider process swapping overhead is 0.5 ms.	<b>07</b>
1) SJF (Non-preemptive)	
2) Priority Scheduling (Preemptive)	
<b>Q.3</b> (a) Give the difference between weak semaphore and strong semaphore.	<b>03</b>
(b) Briefly explain critical section.	<b>04</b>
(c) Explain producer-consumer problem and solve it using semaphore. Write pseudo code for the same.	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Give the key difference between a mutex and a binary semaphore.	<b>03</b>
(b) List the requirements for mutual exclusion.	<b>04</b>
(c) Explain Dining philosopher problem and its solution using semaphore.	<b>07</b>
<b>Q.4</b> (a) Explain I/O buffering in brief.	<b>03</b>
(b) Write a short note on Access Control List.	<b>04</b>
(c) Write and explain Banker's Algorithm for deadlock avoidance with suitable example.	<b>07</b>
<b>OR</b>	
<b>Q.4</b> (a) Compare RAID level 3 with RAID level 4.	<b>03</b>
(b) Write a short note on design principles of OS security.	<b>04</b>
(c) Write and explain deadlock detection algorithm with suitable example.	<b>07</b>

- Q.5 (a)** Explain concept of thrashing. **03**
- (b)** Given the following track requests in the disk queue, compute for the Total Head Movement (THM) of the read/write head and seek time needed for SSTF Disk Scheduling approach:  
86, 147, 91, 230, 94, 168, 270, 30  
Consider that the read/write head is positioned at location 150. A seek takes 3 ms per cylinder move. Consider a disk drive with 300 cylinders. **04**
- (c)** Explain any three memory placement algorithms with suitable example. **07**
- OR**
- Q.5 (a)** Compare and contrast paging with fragmentation. **03**
- (b)** Given the following track requests in the disk queue, compute for the Total Head Movement (THM) of the read/write head and seek time needed for C-SCAN Disk Scheduling approach:  
95, 180, 34, 119, 11, 123, 62, 64  
Consider that the read/write head is positioned at location 50. A seek takes 5 ms per cylinder move. Consider a disk drive with 200 cylinders. **04**
- (c)** Explain any three page replacement algorithms with suitable example. **07**

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