USN

RV University

School of Computer Science and Engineering

B.Tech Degree Examination-June 2025

Semester : II

Course Code : CS1103

Course Title : Operating System

Duration : 2 Hours **Max. Marks: 30**

Instructions to students:

1. *Answer all Questions*
2. *Scientific calculators are allowed*

<table>
<tr><th>Sl. No.</th><th>PART A</th><th>Marks</th><th>L1-L6</th><th>CO</th></tr>
<tr><td>1.</td><td>a. Explain the functions of Operating System (any four).

b. Calculate the average turnaround time, and average waiting time for the given arrival time and burst time by applying the Round Robin algorithm by considering T=2 (Time quantum)
<table>
<tr><th>Process</th><th>Arrival time</th><th>Burst time</th></tr>
<tr><td>P1</td><td>0</td><td>5</td></tr>
<tr><td>P2</td><td>1</td><td>3</td></tr>
<tr><td>P3</td><td>2</td><td>1</td></tr>
<tr><td>P4</td><td>3</td><td>2</td></tr>
<tr><td>P5</td><td>4</td><td>3</td></tr>
</table></td><td>2

3</td><td>L2

L3</td><td>CO1

CO2</td></tr>
<tr><td>2.</td><td>Consider a system with 5 processes (P1, P2, P3, P4, P5) and 4 resource types (A, B, C, D). The system has the following allocation and maximum matrices:

The Available resources are: A = 1, B = 5, C = 2, D = 0</td><td>5</td><td>L4</td><td>CO3</td></tr>
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Process	Allocation (A B C D)	Max (A B C D)
P1	0012	0012
P2	1000	1750
P3	1354	2356
P4	0632	0652
P5	0014	0656

Using the Banker's Algorithm, answer the following:

1. Calculate the Need matrix.
2. Analyse if the system is in a safe state using the Banker's Algorithm.
3. Determine the total amount of resources of each type.

Sl. No.	PART B	Marks	L1-L6	CO
3.	a. Describe the different types of semaphores used in an operating system (OS) with appropriate examples for each.	5	L2	CO3
	b. Illustrate the Key Steps in I/O Request Handling with an example.	5	L2	CO3
4.	a. Suppose a disk has 200 tracks (0-199). The request sequence is (82,170,43,140,24,16,190) of the disk. The head start is at request 50 (Current position of R/W head). Calculate the total number of track movements by R/W head by applying FCFS, SSTF, SCAN disk scheduling algorithms (Move toward the largest number).	5	L3	CO4
	b. Analyse the given page reference string: 3, 2, 1, 3, 4, 1, 6, 2, 4, 3, 4, 2, 1, 4, 5, 2, 1, 3, 4 Using three available page frames, apply the following page replacement algorithms:	5	L4	CO4

	i. First-In-First-Out (FIFO) ii. Least Frequently Used (LFU) For each algorithm: 1. Break down and illustrate the step-by-step process of page replacement decisions. 2. Identify the number of page hits and misses. 3. Calculate the hit ratio and miss ratio based on your analysis.			

Course Outcomes

CO1. Understand the structural components and core functionalities of an operating system.
CO2. Apply process management techniques and scheduling algorithms to ensure efficient execution and resource allocation.
CO3. Apply synchronization techniques and design solutions to prevent or resolve deadlocks in concurrent systems.
CO4. Illustrate the memory management strategies, principles of file system design, and security mechanisms for efficient performance, resource utilization, and reliable data handling in operating systems.

Marks Distribution									
L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4
-	12	8	10	-	-	2	3	15	10