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Course:	Operating Systems	Course Code:	CS 2006
Program:	BS(Computer Science)	Semester:	Spring 2025
Duration:	20 Minutes	Total Marks:	10
Paper Date:	6-May-2025	Weight	
Section:	6A	Page(s):	2
Exam:	Quiz 4	CLO:	5

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Answer the questions in the given available space. [2 + 8= 10 Marks]

Q:1 Define deadlock. List the four necessary conditions for a deadlock to occur.

When two process are unable to execute concurrently, this is due to deadlock. It is basically a condition in which the processes are trying to allocate themselves, but are unable to do so. These are the four conditions for it to occur.

(1) mutual exclusion ✓
(2) preemption
(3) circular lock ✓
(4) hold and wait ✓

Q:2 Consider the following resource allocation table. Determine whether the system is in a deadlock state using the Banker's Algorithm. If not, provide a safe sequence.

need matrix = max - allocation

Process	Allocation	Max	
P0	[1 2 2]	[3 4 4]	[2 2 2]
P1	[2 0 2]	[3 3 3]	[1 3 1]
P2	[2 2 1]	[4 3 3]	[2 1 2]
P3	[1 1 1]	[2 2 2]	[1 1 1]
P4	[0 0 2]	[2 3 3]	[2 3 1]

The **Available resources** are: **[4 3 2]**.

(i) Calculate the **Need** matrix (2 Marks)
(ii) If the system is in a **safe state**, provide the **safe sequence**(6 Marks)

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need matrix ≤ available

if ((available) + (allocation)) (available)

i) P_0 occurs $[4\ 3\ 2] + [1\ 2\ 2] = [5\ 5\ 4]$

ii) P_1 occurs $[5\ 5\ 4] + [2\ 0\ 2] = [7\ 5\ 6]$

iii) P_2 occurs $[7\ 5\ 6] + [2\ 2\ 1] = [9\ 7\ 7]$

iv) P_3 occurs $[9\ 7\ 7] + [1\ 1\ 1] = [10\ 8\ 8]$

(v) P_4 occurs $[10\ 8\ 8] + [0\ 2\ 2] = [10\ 10\ 10]$

yes it is in safe state and the safe sequence is :-

$P_0 \rightarrow P_1 \rightarrow P_2 \rightarrow P_3 \rightarrow P_4$ ✓