National University
of Computer and Emerging Sciences
Chiniot-Faisalabad Campus

OPERATING SYSTEMS

ASSIGNMENT 6

FALL 2024

Course/Topic	Course Instructors
CS 2006 Operating Systems Topic = Deadlocks and Memory Management	Mr. Tahir Farooq
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DEADLINE: Mentioned on Google Classroom

Guidelines:

- **A single violation of guidelines will lead to Zero marks in your assignment.**
- **Deadlines should be kept in mind. No extension in assignment dates would be given. Late submission will not be accepted.**
- **This is an individual assignment. PLAGIARISM IS NOT ACCEPTABLE AT ALL! Be prepared for extreme consequences if you plagiarize your assignment.**
- **All answers must in order otherwise marks will be deducted.**
- **Assignment viva will be scheduled after the deadline in the following week. Make sure you are fully prepared.**
- **For any query/ambiguity, you can mail your Instructor.**
- **You must have to submit it in Hard form.**
- **Total Marks: 70**

Question No 01:

Assume that there are 5 processes, P0 through P4, and 4 types of resources. At T0 we have the following system state:

	Allocation				Max				Available			
	A	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
P0	0	1	1	0	0	2	1	0	1	5	2	0
P1	1	2	3	1	1	6	5	2				
P2	1	3	6	5	2	3	6	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

1. Create the need matrix (max-allocation)?
2. Use the safety algorithm to test if the system is in a safe state?
3. If the system is in a safe state, can the following requests be granted, why or why not? Please also run the safety algorithm on each request as necessary.
    1. P1 requests (2,1,1,0)
    2. P1 requests (0,2,1,0)

Question No 2:

1. If there are 6 units of resource R in the system and each process in the system requires 2 units of resource R, then how many processes can be present at maximum so that no deadlock will occur?
2. Suppose a system has four resource types, i.e., DVD Drive, Hard Drive, Tape Drive and printer. A process P copies a file from Tape Drive to Hard Drive and then sends the file from Hard Drive to Printer for printing. If the system uses 'Eliminate Circular-wait' as a deadlock prevention mechanism, elaborate how will the system implement it.

Question No 03:

1. Consider the following set of process and there size P_0→ 250 MB, P_1→ 115 MB, P_3→ 550 MB, P_4→ 400 MB, P_5→ 700 MB, P_6→ 800 MB,

BEST FIT		FIRST FIT		WORST FIT	
	300		300		300
	400		400		400
	500		500		500
	800		800		800
	1000		1000		1000
	400		400		400
	200		200		200

2. Find the total internal fragmentation for each contiguous memory allocation method solved in part 1.

Question No 04:

Suppose following number of processes along with resources instance currently running in a system.

- P= {P1, P2, P3, P4, P5}
- R = {R1, R2, R3, R4, R5}

Resource Instances

- 2 instance of resource type R1
- 2 instances of resource type R2
- 1 instance of resource type R3
- 1 instance of resource type R4
- 1 instance of resource type R5

Process States

- Process P1 is holding 1 instance of resource R1, and is waiting for an instance of resource R2.
- Process P2 is holding an instance of resource R2 and R3, and is waiting for an instance of resource R4.
- Process P3 is holding 1 instance of resource R2 and waiting for an instance of resource R1 and R5.
- Process P4 is holding 1 instance of resource R5 and R1, and also waiting for an instance of resource R3.
- Process P5 is holding 1 instance of R4 and waiting for an instance of resource R1.

Considering the above system states **You are required to draw the Resource Allocation Graph and state that either system is in safe state or not. Briefly justify your answer.**

Question No 05:

Consider the system having multiple instances of each resource type and you are provided with the resources allocation with the demand and the system reach at the point where each processes demand for remaining resources. So, the data set is.

Process	Max-Need				Allocated Resources				Remaining need				Available resources			
	A	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
P0	9	6	6	3	3	3	3	1					**4**	**2**	**5**	**1**
P1	15	6	7	5	2	5	2	1								
P2	14	5	6	1	1	3	1	0								
P3	4	3	5	3	2	1	2	0								
P4	8	7	6	9	5	3	1	3								
P5	3	2	8	5	3	2	5	4								
P6	9	6	9	9	1	1	3	3								

i. Find remaining need

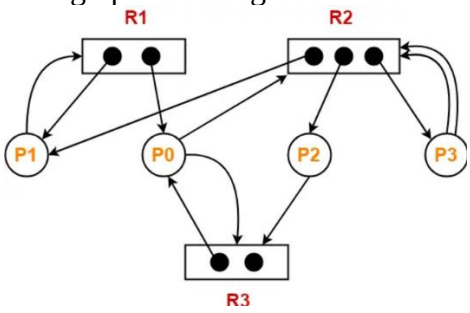
ii. Find total number of resources of each type.
iii. Find whether the system is in safe state or not if yes find the safe sequence using all computation

Question No 06:

1. Find the Effective Access Time for the pages of size 6MB (For swap out and swap in) at the transfer rate of 1.2MB/sec, and the amount of time to handle page fault is 0.1 second. And the memory access time is 200 milli second, what is the effective access time.
2. Find the Effective Access Time for the pages of size 6MB (For swap out and swap in) at the transfer rate of 1.2MB/sec, and the amount of time to handle page fault is 0.1 second. And the memory access time is 200 milli second, what is the effective access time.

Question No 07:

Consider the resource allocation graph in the figure-



Find if the system is in a deadlock state otherwise find a safe sequence.

Question No 08:

Consider the following resource allocation graph:

- Processes: **P1**, **P2**, **P3**, **P4**
- Resources: **R1**, **R2**, **R3**

Allocation:

- **R1** is allocated to **P1** and requested by **P2**.
- **R2** is allocated to **P2** and requested by **P3**.
- **R3** is allocated to **P3** and requested by **P4**.
- **P4** requests **R1** (already allocated to **P1**).

Tasks:

1. Draw the resource allocation graph.
2. Determine if the system is in a **safe state** or **deadlocked**.
3. If deadlock exists, identify the processes involved in the deadlock cycle.