UECS2103 Operating Systems
Tutorial 5

1. There are 3 resources and 3 processes, each process requires 2 resources for its operation. Briefly describe a scenario where deadlock may occur and draw a Resource Allocation Graphs to illustrate the scenario.

2. List the conditions that cause a deadlock occurs.

3. Consider the system state below.

	Maximum demand				Current allocation			
	R1	R2	R3	R4	R1	R2	R3	R4
P1	2	0	1	0	1	0	0	0
P2	4	3	6	0	1	0	2	0
P3	3	2	4	1	0	0	1	1
P4	3	4	5	6	2	0	1	4
P5	6	6	9	8	0	3	3	3

Total unit of resources: R1: 6, R2: 6, R3: 10, R4: 10

a) Is the state of system safe?

b) If one unit of R2 allocated to P5 is forcibly released and allocated to P4, will it affect the system state? Show your calculation to support your answer.

4. Consider the state of a system based on the table below. The total resource unit of R1, R2, R3 and R4 is 4, 4, 5 and 3 respectively.

	Max. requirement				Current allocation			
Process	R1	R2	R3	R4	R1	R2	R3	R4
P1	4	2	5	2	0	0	1	1
P2	3	1	4	1	1	1	1	0
P3	1	3	2	1	1	1	0	1
P4	2	1	2	1	1	1	1	1

Given that process P1 has requested for an additional unit of resource R3, determine whether the request should be granted by using banker's algorithm (show the details of your calculation, including the resources needed by each process and the resources available).

5. Consider a system with 150 units of memory, allocated the three processes as below:

Process	Maximum demand	Allocated
A	70	45
B	60	40
C	60	15

Process D arrives later, requires maximum demand of 60 and initial need of 35; apply the banker's algorithm to determine whether it would be safe to grant the request.

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6. Given the information below, apply deadlock detection algorithm.
   Total unit of resources: R1: 4, R2: 2, R3: 3, R4: 1

	Request					Current allocation			
	R1	R2	R3	R4		R1	R2	R3	R4
P1	2	0	0	1		0	0	1	0
P2	1	0	1	0		2	0	0	1
P3	2	1	0	0		0	1	2	0

7. What are the possible approaches that can be used when a deadlock is detected?

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Tutorial 6

1. Briefly describe internal fragmentation and external fragmentation.

2. Given free memory partitions in the order of 200K, 100K, 300K and 400K, and the next four memory requests are 96K, 160K, 256K, and 339K. How would the processes placed in memory by the First-fit and Best-fit algorithms?

3. The next three memory requests are for 50M, 10M, 20M and 30M. Find the starting address for each of the three blocks using the following algorithms:

10M	20M	40M	60M	70M	40M	50M	20M	30M
X		X		X			X	

   - First-fit
   - Best-fit
   - Next-fit, assume that the most currently allocated block is the block of 70M

4. Consider a buddy system with 1MB of memory. Show the memory partitioning and allocation for the following requests.

   102K, 120K, 16K, 200K, 50K, 250K