Assignment:Module-2

Course: B.Tech (CSE) **Year/Semester:** II/IV **Session:** 2023-2024
Subject Name & Code: Operating Systems (BCSC0004)

Q1: Free memory holes of sizes 15K, 10K, 5K, 25K, 30K, 40K are available. The processes of size 12K, 2K, 25K, 20K is to be allocated. How processes are placed in first fit, best fit, worst fit. Calculate internal as well as external fragmentation.

Q2: System snapshot:

	Max	Allocation	Available
	A B C	A B C	A B C
P_0	0 0 1	0 0 1	
P_1	1 7 5	1 0 0	
P_2	2 3 5	1 3 5	
P_3	0 6 5	0 6 3	
Total		2 9 9	1 5 2

a) How many resources are there of type (A, B, C)?
b) What are the contents of the Need matrix?
c) Is the system in a safe state? Why?
d) If a request from process P1 arrives for additional resources of (0, 5, 2), can the Banker's algorithm grants the request immediately?
e) What would be the new system state after the allocation?

Q3: Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Is this system deadlock-free? Why or why not?

Q4: Consider the following snapshot-

	Allocated				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using banker's algorithm:
a) What are contents of matrix end?
b) Is the system in safe state?
c) If request for process p1 arrives for (0, 4, 2, 0) .Can the request be granted immediately?

Q5. Given 3 processes A,B and C, three resources x,y and z and following events, i) A requests x ii) A requests y iii) B requests y iv) B requests z v) C requests z vi) C requests x vii) C requests y Assume that requested resources should always be allocated to the request process if it is available. Draw the resource allocation graph for the sequences. And also mention whether it is a deadlock? If it is, how to recover the deadlock.

Q6. An operating system uses the Banker's algorithm for deadlock avoidance when managing the allocation of three resource types X, Y, and Z to three processes P0, P1, and P2. The table given below presents the current system state. Here, the Allocation matrix shows the current number of resources of each type allocated to each process and the Max matrix shows the maximum number of resources of each type required by each process during its execution.

	Allocation			Max		
	X	Y	Z	X	Y	Z
P0	0	0	1	8	4	3
P1	3	2	0	6	2	0
P2	2	1	1	3	3	3

There are 3 units of type X, 2 units of type Y and 2 units of type Z still available. The system is currently in a safe state. Consider the following independent requests for additional resources in the current state:

Req1: P0 requests 0 units of X, 0 units of Y and 2 units of Z
Req2: P1 requests 2 units of X, 0 units of Y and 0 units of Z
Can the requests be granted immediately?

Q7. A system shares 9 tape drives. The current allocation and maximum requirement of tape drives for 4 processes are shown below:

Process	Maximum need	Current allocation
P1	9	3
P2	6	1
P3	5	3
P4	10	0

Describe the current status of the system as safe or unsafe.

Q8: Consider a computer system with 40-bit virtual addressing and page size of sixteen kilobytes. If the computer system has a one-level page table per process and each page table entry requires 48 bits, then the size of the per-process page table is _____ megabytes.

Q9: A computer system implements 8 kilobyte pages and a 32-bit physical address space. Each page table entry contains a valid bit, a dirty bit, three permission bits, and the translation. If the maximum size of the page table of a process is 24 megabytes, the length of the virtual address supported by the system is _____ bits.

Q10: Consider a paging hardware with a TLB. Assume that the entire page table and all the pages are in the physical memory. It takes 10 milliseconds to search the TLB and 80

milliseconds to access the physical memory. If the TLB hit ratio is 0.6, the effective memory access time (in milliseconds) is