

Assignment Module-2

Course: B.Tech (CSE All)

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Subject Name & Code: Operating Systems (BCSC0004)

Submission Date:

Q1: Consider the following page reference string. 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2 How many page faults would occur for the following replacement algorithm, assuming 3, 4 and 5 frames respectively?

a. Optimal page replacement. b. LRU page replacement. c. FIFO page replacement

Q2: 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.

Q3: Calculate page faults for (LRU, FIFO, OPT) for following sequences where page frame is three.

0,1,2,1,4,2,3,7,2,1,3,5,1,2,5.

Q4: 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

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

Q5: 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?

Q6: 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:

- What are contents of matrix end?
- Is the system in safe state?
- If request for process p1 arrives for (0, 4, 2, 0). Can the request be granted immediately?

Q7. 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.

Q8. 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.

Q9. Describe the SSTF disk scheduling algorithm using the following data. The dist head is initially at position-cylinder 53.the cylinder sequence of requests is 98, 183, 37, 122, 14, 124, 65. 67. Find the total head movement.

Q10. Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive currently services a request at cylinder 143, and the previous request was at cylinder 125. the queue of pending request in FIFO order is 86,1470,913,1774,948,1509,1022,1750,130 Starting from the current position, what is the total distance(in cylinders) that the disk arm moves to satisfy all pending requests, for each of the following algorithms i)FCFS ii) SSFT iii) SCAN iv) LOOK v) C-SCAN.

Q11. The queue of requests in FIFO is 86, 147, 91, 177, 94,150,102,175,130 what is the total head movement needed to satisfy the requests for the following Scheduling algorithms FCFS, SJF, SCAN, LOOK, C-SCAN.

Q12: Suppose that the head of moving head disk with 200 tracks numbered 0 to 199 is currently serving the request at track 143 and has just finished a request at track 125. If the queue request is kept in FIFO order, 86, 147, 91, 177, 94, 150, 102, 175, 130. What is the total head movement to satisfy these requests for i) FCFS II) SSTF disk scheduling algorithm

Q13: A system contains three programs and each requires three tape units for its operation. The minimum number of tape units which the system must have such that deadlocks never arise is _____.

Q14: Assume that in a certain computer, the virtual addresses are 64 bits long and the physical addresses are 48 bits long. The memory is word addressable. The page size is 8 kB and the word size is 4 bytes. The Translation Look-aside Buffer (TLB) in the address translation path has 128 valid entries. At most how many distinct virtual addresses can be translated without any TLB miss?

Q15: 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.

Q16: 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.

Q17: Assume that there are 3-page frames which are initially empty. If the page reference string is 1, 2, 3, 4, 2, 1, 5, 3, 2, 4, 6, the number of page faults using the optimal replacement policy is _____.

Q18: 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?

Q19: Consider the virtual page reference string 1, 2, 3, 2, 4, 1, 3, 2, 4, 1 On a demand paged virtual memory system running on a computer system that main memory size of 3 pages frames which are initially empty. Find the number of page faults under the corresponding page replacements policy.: LRU, FIFO and OPTIMAL.

Q20 A system uses FIFO policy for page replacement. It has 4 page frames with no pages loaded to begin with. The system first accesses 100 distinct pages in some order and then accesses the same 100 pages but now in the reverse order. How many page faults will occur?

Q21: A process has been allocated 3 page frames. Assume that none of the pages of the process are available in the memory initially. The process makes the following sequence of page references (reference string): 1, 2, 1, 3, 7, 4, 5, 6, 3, 1 If optimal page replacement policy is used, how many page faults occur for the above reference string?

Q22: In a virtual memory system, size of virtual address is 32-bit, size of physical address is 30-bit, page size is 16 Kbyte and size of each page table entry is 32-bit. The main memory is byte addressable. Which one of the following is the maximum number of bits that can be used for storing protection and other information in each page table entry?

Q23: Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB. These partitions need to be allocated to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order.

Perform the allocation of processes using-

1. First Fit Algorithm
2. Best Fit Algorithm
3. Worst Fit Algorithm