
Note : Answer all the parts of a question together . Draw a line, separating each part

Q1. Answer the following questions in brief. Answers without reason will not be given any credit.

- List the advantage and disadvantage of having separate queue in case of unequal size partitions in fixed partitioning scheme
- List the disadvantage of maintaining the two dimensional page table containing page number and corresponding frame number
- List the issue associated with compile time address binding and how it can be handled with load time address binding
- Write one advantage and one disadvantage of reducing the page size.
- A system has 5 disk A, B, C, D, and E with each having capacity of 800 MB , 700MB , 1GB , 1.5 GB and 600 MB respectively. The system is using RAID 6. Find the maximum amount of user data that can be stored.
- What is the number of read and write operation required in case of modifying a data stripe on RAID 5 system . Support your answer with reason.
- It is advised to use Cnotify as opposed to Csignal in case of Monitor. Explain in brief

[1*7]

Q2. A processor is having 46-bit instruction pointer and supports multilevel paging. Outermost and inner page tables are paged. The size of outermost page table entry is of 16 bytes and the size of other page table entries are of 8 byte each . The innermost page table can have maximum of 4 K entries. The processor has TLB that can store 48 most recently translated addresses.

- What is the maximum size of a virtual address space supported by the system?
- Find the total number of pages in the logical address space.
- Find the maximum number of innermost page tables that can be supported for a process by the system.
- Draw the complete linear to physical address translation diagram, completely indicating the size of various fields of linear address and address computation.
- There is a process with a virtual address space of size 1056 MB. Assuming that the entire processes is in memory, how many valid Page table entries will exist in the page table for this process? Find the total amount of memory required by OS to execute this process.
- For the process described in part (e) , find the internal fragmentation in KB. Ignore the OS overhead.
- Find the TLB reach.

[1+1+2+5+2+2+1]

Q3. A fast food outlet, Burger Sam, plans to automate its operation. It sells two items, Burgers and French fries. Company has two chefs Chef1 and chef2 The company also has a dish washer operator. The chef1 prepares burgers and chef2 prepares French fries. The company has three counters named BURGER, FRIES and CLEAN PLATE. The BURGER and FRIES counter can hold at most 5 Burgers and 5 French fries Packets respectively. The CLEAN PLATE counter can hold at most 10 Cleaned plates at a time. The chefs prepare burgers and fries and keep it on the designated counter. The dish washer operator cleans the used plates using dish washer and keeps the clean plates on CLEAN PLATE counter.

There are two types of customers named Thin and Fat. Thin customers eat burgers and fries both whereas Fat customers only eat fries. When a customer arrives, it first picks up a clean plate and then depending upon customer type, it goes to food counters and picks up the food items. Thin customer first picks up the burger and then picks up the French fries. After finishing, the customer puts the plate in dish washer. All the three counters are accessed in mutually exclusive manner.

Write the pseudo code for synchronizing the operation using non-blocking send and blocking receive message passing primitives. Assume dish washer is a shared resource.

[15]

- Q.4 Answer the following questions in brief
- Consider a system that supports 5000 users. Suppose that you want to allow 4900 of these users to be able to access one file. Suggest two different methods for specifying this protection scheme.
 - Consider a file system that supports the strategies of contiguous, linked, and indexed data allocation. What criteria should be used to decide which strategy is best utilized for a particular file?
 - Consider a file system on a disk that has both logical and physical block sizes of 512 bytes. Assume that the information about each file is already in memory. If we are currently at logical block 10 (the last block accessed was block 10) and want to access logical block 4, how many physical blocks must be read from the disk for each of the three allocation strategies, i.e., contiguous, linked, and indexed?
 - Assuming that all files and directories are exactly one disk block in size, how many disk reads are required to locate the file named /usr/bin/os and read it into memory? Assume that the file descriptor for the root directory is already in memory. Explain your answer.

[1+3+1.5+1.5]

- Q.5 Consider a file that is 1000 disk blocks in size. Assume that a disk block is appended to the end of the file, which causes the file size to grow to 1001 blocks. How many disk read and write operations are required to update the file and the file descriptor? Assume that the file is stored as a linked list with the pointer to the next file block stored at the end of each block. Also, assume that both the file and the file descriptor are initially on disk and that file buffer cache is empty. How will your answer change if a multi-level index scheme is used instead of a linked file organization?

[4]

- Q6. A SAS Hard disk operating at 100RPM has total number of 600 cylinders numbered from 0 to 599. The average seek time is 3 milliseconds. At some instance of time the disk has following outstanding requests:
206, 96, 130, 120, 85, 189, 530, 72, 226, 164, 46, 28, 91 and 62.

The current head position is at cylinder number 180 and the previous cylinder number was 69

- Write the disk scheduling sequence for the following algorithms and give the total seek distance for each algorithm
 - FCFS
 - SCAN
 - SSTF
- For the SCAN algorithm find out the average turnaround time for serving the requests. Assume rotational latency and transfer time to be negligible.
- Find the IOPS for the given disk

[2*3+3+1]

- Q7. A system is having three data disk named A, B, C and RAID DP is implemented .
- Write the Parity and diagonal Parity expression for first 4 Stripes (rows of striped disk)
 - Show the recovery steps, if Disk A and C fails simultaneously

[4+3]

- Q8. The virtual address space is referenced by a process as given below. Assuming 4 frames are allocated, Show the content of frames after every memory reference and find number of page faults for the following replacement algorithms

2, 1, 5, 7, 4, 2, 1, 5, 6, 5, 1, 2, 3, 8, 5, 6, 7, 4,

- LRU
- FIFO
- Optimal

[3*3]

- Q9. Answer the following questions.
- In case of Intel 32-bit processor supporting 4GB physical memory, segment of size 4 GB can be defined. Segment descriptor uses 20-bit value for specifying the size. Explain how 4 GB segment can be defined.
 - Explain the role of code segment descriptor in code segment descriptor.
 - An intel processor based system using demand segmentation for accessing the main memory. Give the give the block schematic diagram to show the logical to physical address translation and briefly explain the process

[2+2+3]
