

Q 1. (a) List the major activities of an operating system with respect to memory management, secondary storage management and process management. [4]

(b) Consider a system with 2-level paging scheme in which a regular memory access takes 150 ns and serving a page fault takes 8 ms. An average instruction takes 100ns of CPU time and 2 memory accesses. The TLB hit ratio is 90% and page fault rate is one in every 10,000 instructions. What is the average instruction execution time? [4]

Q 2. (a) What is a race condition? Explain how does a critical section avoid this condition. What are the properties which a data item should possess to implement a critical section? [4]

(b) Describe a solution to the Dining philosopher problem so that no races arise. [4]

(b) Why are Translation Look-aside Buffers (TLBs) important? In a simple paging system, what information is stored in a typical TLB table entry? [3]

Q 4. (a) Consider the situation in which the disk read/write head is currently located at track 45 (of tracks 0-255) and moving in the positive direction. Assume that the following track requests have been made in this order: 40, 67, 11, 240, 87. What is the order in which optimized C-SCAN would service these requests and what is the total head movement? Also, calculate the total head movement in case of shortest seek time first. [5]

(b) What are interacting processes? Explain any two methods of implementing interacting processes. [3]

Q 5. (a) What criteria should be adopted for choosing the type of file organization. [3]

(b) Why is segmented paging important (as compared to a paging system)? What are the different pieces of the virtual address in a segmented paging? [3]

(c) Explain Peterson's solution. [2]

Q 6. (a) Consider the following page reference and reference time strings for a program: Page reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5. Show how pages will be allocated using the LRU and Optimal page replacement policy. Also, calculate the total number of page faults when allocated page blocks are 3 and 4 respectively. [5]

(b) What is meant by inter process communication? Explain the two fundamental models of inter process communication. [3]

Q 7. Write short notes on the following (any four): [2*4=8]

(a) Spooling

(b) Internal and external fragmentation.

(c) Paging and segmentation

(d) Disk structure

(e) Overlays