

1. Consider a memory system with the following parameters :

$$(20\%) \quad T_c = \text{Cache access time} = 100 \text{ ns}$$

$$T_m = \text{Main Memory access time} = 1200 \text{ ns}$$

$$H = \text{Hit ratio} = 0.95$$

$$C_c = \text{Average cost per bit, Cache} = 0.01 \text{ \$/bit}$$

$$C_m = \text{Average cost per bit, Main memory} = 0.001 \text{ \$/bit}$$

(1) What is the cost of a 1 MByte main memory ?

(2) What is the cost of a 1 MByte main memory using cache technology ?

(3) Design a main memory/cache system with 1 MByte of main memory whose effective cycle time is no more than 10% greater than the cache memory cycle time. What is its cost ?

2. (1) In virtually all systems that include DMA modules, DMA access to main memory is given higher priority than CPU access to main memory. Why ?

(15%) (2) A DMA module is transferring characters to memory using cycle-stealing, from a device transmitting at 9600 bps. The CPU is fetching instructions at a rate of 1 million instructions per second (1 MIPS). By how much will the processor be slowed down due to the DMA module ?

3. About the multiprocessor, describe and explain in details :

(1) the classification

(2) the organization

(3) Time-shared bus

(4) Multiport memory

4. For the dynamic memory management, describe and explain in details :

(1) In what situation, we need this kind of techniques ?

(15%) (2) First fit

(3) Best fit

(4) Worst fit

5. Assume that an array of 10 integers contains the elements
 $1, 3, 7, 15, 21, 22, 36, 78, 95, 106$

Use the recursive binary search algorithm listed in the following
 to find each of the following items in the array

- (1) 1 (2) 20 (3) 36

(20%)

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1 if low > high
2 then binsrch := 0
3 else begin
4     mid := (low + high) div 2;
5     if x = a[mid]
6         then binsrch := mid
7     else if x < a[mid]
8         then search for x in a[low] to a[mid-1]
9     else search for x in a[mid+1] to a[high]
10 end {else begin}

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6. The figure shown is the architecture

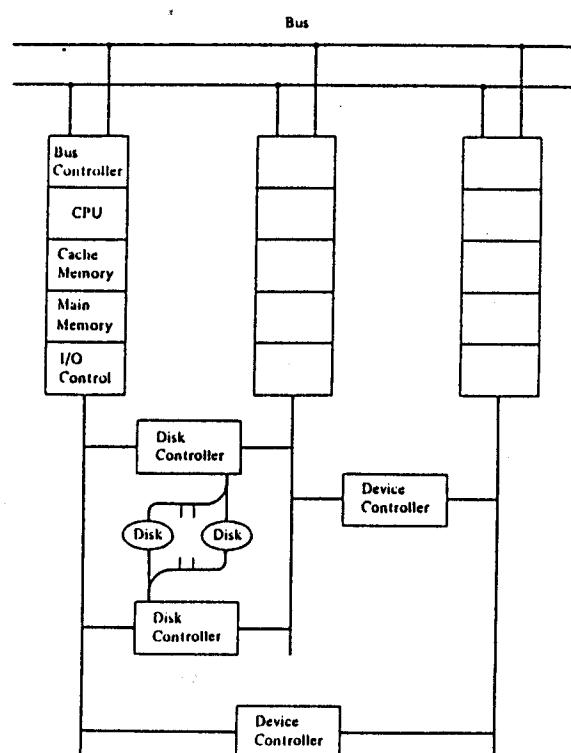
of Tandem Nonstop System

(A kind of fault-tolerant

System).

- (15%) (1) Explain the operation principle
 of the whole system.

- (2) Describe the backup process
 strategy of Tandem system.



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