

八十五學年度國立台灣工業技術學院研究所碩士班招生考試

所別：電機工程技術研究所

組別：計算機組

科目：計算機組織

- Consider a computer system that contains an I/O module controlling a simple keyboard/printer teletype. The following registers are contained in the CPU and connected directly to the system bus:
 INPR: input register-4 bits
 OUTR: output register-4 bits
 FGI: input flag-4 bits
 FGO: output flag-4 bits
 IEN: interrupt enable-1 bit
 Keystroke input from the teletype and printer output to the teletype area controlled by the I/O module. The teletype is able to encode an alphanumeric symbol to an 8-bit word and decode an 8-bit word into an alphanumeric symbol.
 a. Describe how the CPU can achieve I/O with the teletype using only the first four registers. (10%)
 b. Describe how the function performance can be changed by also employing IEN. (10%)
- In some machines, addresses are staggered in two or even more separate main memory units. List and explain the purpose(s) of using this technique. (15%)
- A 32-bit bus has two selector channels and one multiplexor channel. One selector channel supports two magnetic disk and two magnetic tape units. The other selector channel supports two magnetic tapes and one line printer. The multiplexor channel has two line printers, two card readers, and ten VDT terminals connected to it. Assume the following transfer rates:
 Disk drive 800 Kbytes/s
 Magnetic tape drive 200 Kbytes/s
 Line printer 6.6 Kbytes/s
 Card reader 1.2 Kbytes/s
 VDT 1 Kbytes/s
 Estimate the maximum aggregate I/O transfer rate in this system. (15%)
- The access time of a cache memory is 100 ns and that of main memory 1000 ns. It is estimated that 80 percent of the memory requests are for read and the remaining 20 percent for write. The hit ratio for read accesses only is 0.9. A write-through procedure is used.
 a. What is the average access time of the system considering only memory read cycles? (10%)
 b. What is the average access time of the system for both read and write requests? (10%)
 c. What is the hit ratio taking into consideration the write cycles? (10%)
- A word-organized RAM is sometimes used to store messages of varying length having the linked-list format shown in figure 1. Each item in the list contains $t+p$ words, where t is the number of words of message text and p is the number of words in the link. The link is the address of the next item in the list. The storage space (shown shaded) not used in the last list item A_n and the space occupied by the links are regarded as overhead, or "waste", space. Assume that the message lengths are randomly distributed with mean value L . Show that wasted space is a minimum when t is chosen to be approximately $\sqrt{2pL}$. (20%)

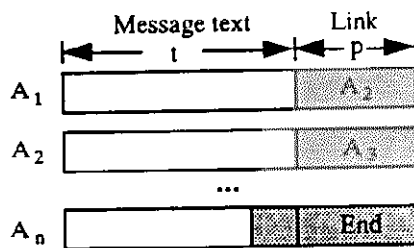


Figure 1 Linked-list message format

