

# 國立臺北科技大學

## 九十三年度電機工程系碩士班入學考試

### 計算機概論試題

填 准 考 證 號 碼

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**注意事項：**

1. 本試題共【八】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. (15%) The various methods of transferring data between a peripheral device and the microprocessor and/or memory of a microcomputer can be categorized into three types:

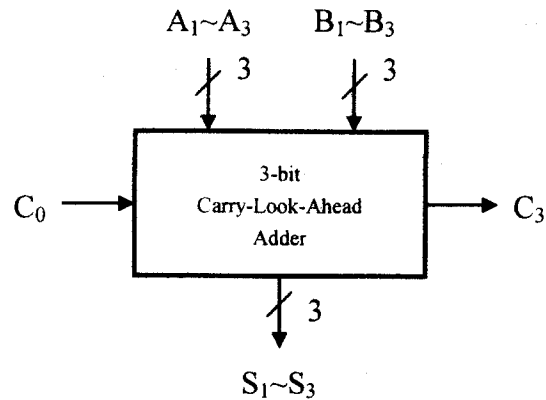
- (a) Programmed input/output
- (b) Interrupt-driven input/output
- (c) Direct Memory Access

Explain carefully the differences between the three types, comment on their efficiency in terms of data transfer rate and processor utilization, and briefly describe one typical application of each method.

2. (5%) A computer has cache memory, main memory, and disk space treated as virtual memory. If a referenced word is in the cache 15 ns are required to access it. If it is in the main memory but not in the cache, 60 ns are required to load it into the cache and then reference starts. If the word is not in the main memory, 12 ms are required to fetch from disk, followed by 60 ns to copy it into the cache and then the reference starts. The cache hit ratio is 0.9 and the main memory hit ratio is 0.6. What is the average time in nanoseconds required to access a referenced word on this system?

3. (a) (10%) Refer to the diagram below and design a 3-bit Carry-Look-Ahead Adder by using propagation  $P_i$  and generation  $G_i$  functions. This design only asks for output functions' expressions not for circuit diagrams.

(b) (5%) Explain why Carry-Look-Ahead Adder doesn't have carry propagation delay.



4. For a computer system with 16-bit address bus to the main memory, you are asking to design a 64K byte cache. Compute for each of the following cases, the size of the tag (in bits) associated with each cache line and the total size of the cache including tag and valid bits.
- (5%) Direct mapped cache with line size of 16 bytes.
  - (5%) Fully associative cache with line size of 16 bytes.
  - (5%) 4-way set associative cache with line size of 8 bytes.
5. (a) (5 %) Each Internet host has at least one local name server and one authoritative name server. What role does each of these servers play in DNS?
- (b) (5%) Describe respectively what viruses, worms, and Trojan horses are.
6. (10%) Both UDP and TCP use port numbers to identify the destination entity when delivering a message. Give three reasons for why these protocols invented a new abstract ID (port number), instead of using process IDs, which already existed when these protocols were designed.
7. Explanations
- (5%) multiprogramming
  - (5%) micro-coded CPU
  - (5%) SOC (system on chip)

8. If there are  $n$  records  $R(1), R(2), \dots,$  and  $R(n)$  possessing keys  $k(1), k(2), \dots,$  and  $k(n)$  respectively. The following pseudo code program segment is mainly sorting these records by their keys in ascending order.

```
Procedure SORT (R, m, n)
// Sort the records R(m), R(m+1), ..., and R(n) in ascending order of the key k.//
  If (m < n) then
    { i = m; j = n + 1; key = k(m);
      Loop
        Repeat i = i + 1 until k(i) >= key;
        Repeat j = j - 1 until k(j) <= key;
        if (i < j) then { temp = R(i); R(i) = R(j); R(j) = temp }
          else exit
      End of loop;
      temp = R(m); R(m) = R(j); R(j) = temp;
      Call SORT (R, m, j-1);
      Call SORT (R, j+1, n)}
  End of Procedure
```

- (a) (5%) Identify what kind of sorting algorithm the program uses.
- (b) (5%) Specify the average and worst-case computing time complexities of this sorting algorithm.
- (c) (5%) If the contents of these keys are  $k(1)=19, k(2)=23, k(3)=2, k(4)=4, k(5)=99, k(6)=1,$  and  $k(7)=8,$  please trace the program and write down each key's value after the third pass of a Call Sort(R,1,7) ends.