※ 注意：全部題目均請作答於試卷內之「非選擇題作答區」，請標明題號依序作答。

1. (38%, 2 points for each problem) Please define the following terms and explain the content, purpose, and application of each term and give an illustrative example if possible. If possible, define the term in mathematical equation. If it is an acronym, please write the full name. For example:

CD-ROM: Compact Disk-Read Only Memory: the most common type of optical storage medium; data is written in a series of lands and pits on the surface of a disk, which can be read by a laser in a CD-ROM drive; stores approximately 650 MB but cannot be altered.

(1) NFC: Near Field Communication (2) Apple Pay (3) SSD (4) SIMD (5) DDR3 (6) USB (7) DBMS (8) relational database (9) twisted pair (10) adapter card (11) PCI: Peripheral Component Interconnect (12) P2P (13) token ring (14) phishing (15) incremental backup (16) malware (17) firewall (18) ISP: Internet Service Provider (19) firmware

2. (8%) Please draw an example and explain red-black tree in detail. What are the computational complexity orders of search, insertion, and deletion times, respectively?

3. (6%) Please write 9 in 8 bits and its one's complement and two's complement.

4. (8%) Please define vector graph and bitmap graph. What are the differences, advantages, and disadvantages.

5. (8%) Please describe the 4 steps of machine cycle in CPU in detail. Please draw and describe how pipeline can enhance execution speed.

6. (8%) Please define trap and interrupt and explain the differences in detail.

7. (8%) Please write the full names of 4 process scheduling methods: FCFS, RR, SJF, PS. Please list the differences, advantages, and disadvantages.

8. (8%) Fibonacci series is defined as: f(0)=1; f(1)=1; f(n)=f(n-1)+f(n-2), for n >=2. (a) Write f(3), f(4), f(5), …, f(10). (b) Write a recursive program to calculate and print f(0), f(1), f(2), …, f(n).

9. (8%) If we have 8-bit data: 01011010, (a) Define even parity, and which extra bit should we add? (b) Define four extra bits of Hamming error correction code and their equations. Which four extra bits should we add? (c) Give an example of one incorrect bit in above example of 8-bit data: 01011010 and four Hamming error correction bits. Draw how to detect and correct the incorrect bit.

試題隨卷繳回