

1. (44%, 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) OCR: Optical Character Recognition (2) IrDA: Infra-red Data Association (3) register (4) SRAM (5) software engineering (6) CMM: Capability Maturity Model (7) RAID (8) TCP (9) IP (10) RFID (11) Wi-Fi (12) EPROM (13) LAN (14) MPEG (15) bin packing problem (16) traveling salesman problem (17) two's complement (18) carry (19) full adder (20) check sum (21) NAND gate (22) XOR gate

2. (8%) Please explain bubble sort and quicksort in detail. What are their average-case time complexities?

3. (4%) Assume that the variables x and y are both pointers to characters, what does the following C/C++ statement do? Explain in detail how the processing proceeds.

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While (*x++ = *y++);
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4. (4%) iPhone 6 Plus camera captures 8 Mega Pixel images. Each pixel has three primary colors, and each color has 256 intensities. This camera can take 30 images within one second. What is the data rate of this camera?

5. (8%) Please write the seven layers of Open Systems Interconnection (OSI) model and explain their functions in detail.

6. (8%) Let $G=[V, E]$ be a directed graph where V represents vertices, and E represents edges. $E = \{(2, 1), (3, 2), (2, 3), (1, 4), (2, 4), (3, 1), (3, 4)\}$. Each pair (i, j) in E means that there is an arc from node i to node j . Please draw the directed graph and write in-degree and out-degree of each vertex.

7. (8%) Please insert 54, 32, 91, 23, 14, 94, 12, 56, 67, 77 sequentially and construct a binary search tree. Please draw the binary search tree before and after deleting 54 and replacing with in-order successor.

8. (8%) Find and draw the optimal Huffman Codes for string $txxzyxtxytxxx$. Assign code for each character.

9. (8%) Please write at least four mobile phone operating systems.

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