**Part 1: Multiple choice questions (30 %). Each correct answer is worth 3 pts.**

1. In a computer, the _____ subsystem performs arithmetic and logic operations. *(3%)*

   (a) ALU (b) input/output (c) memory (d) control unit

2. For operating system, which one of following statements is correct? *(3%)*

   (a) A small program which is held by RAM and is used to turn on the computer is called the bootstrap program.
   (b) In multiprogramming, most of memory capacity is dedicated to one single program.
   (c) To prevent starvation and deadlock is very important for process manager.
   (d) File manager controls access to I/O devices.

3. _____ is a protocol for retrieving the emails from the mail box. *(3%)*

   (a) SMTP   (b) POP   (c) HTTP   (d) FTP

4. _____ is placed between the CPU and main memory to increment the performance of memory access. *(3%)*

   (a) Virtual memory   (b) DMA   (c) Cache   (d) Flash memory

5. Which one is wrong in the following descriptions about algorithms? *(3%)*

   (a) A program is a combination of sequence constructs, decision constructs, and repetition constructs.
   (b) Pseudocode is an English-like representation of an algorithm.
   (c) An algorithm is an ordered set of unambiguous steps that produces a result and terminates in a finite time.
   (d) Sorting, a process to locate a target in a list of data is a basic algorithm.

6. _____ is a method to compress video. *(3%)*

   (a) Joint Photographic Experts Group (JPEG)   (b) Motion Pictures Experts Group (MPEG)
   (c) American Standard Code for Information Interchange (ASCII)   (d) Unicode

7. A computer has 12GB of memory. Each word is 32 bits. How many bits are needed to address each single word in memory? *(3%)*

   (a) 22 bits   (b) 28 bits   (c) 29 bits   (d) 32 bits

8. Assume 8 bits are used to allocate a signed integer in a computer by using the 2's complement representation. Which is the binary number to represent -88? *(3%)*

   (a) 10101000B   (b) 11011000B   (c) 10001000B   (d) 01011000

9. Which of the following Boolean algebra relations is not correct? *(3%)*

   (a) $X \cdot X = X$   (b) $(X+Y)' = X' + Y'$   (c) $(XY)' = X'+Y'$   (d) $(X+Y+Z)' = X'Y'Z'$

10. In IEEE floating point "excess-127" format, how many bits are defined in the exponent field. *(3%)*

    (a) 1   (b) 7   (c) 8   (d) 127

**Part 2: Short problems (70 %).**

11. Given a function $f(a,b,c,d)=\Sigma m(1,3,9,11,12,13)$. *(6%)*

    (a) **(4pts)** Find the minimum sum of products solution for $f$.

    (b) **(2pts)** Find the value $f$ if a=c=1, b=d=0.

12. **(4pts)** There are 20M bytes needed to be transmitted through a wired network with transmitted speed 100kbps. How much time does it take to transfer all of these bytes?

13. Consider TCP/IP protocol suite. (10%)

   (a) **(6pts)** What is the different between TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) ?

   (b) **(4pts)** Which one is suitable for file transfer? Which one is better for audio transmission? Why?

14. **(6 pts)** Please list and describe the three stages of machine cycle for executing an instruction.

15. Assume all variables are integers. What would be printed by the following C program segment? (18%)

   (a) **(6 pts)**
```
x = 5;
while(x > 3) {
    printf("%d   ", x);
    x--;
}
```
   (b) **(5 pts)**
```
for(x=1; x<5; x++)
    printf("%d   ", x);
```
   (c) **(7 pts)**
```
x = 10;
do{
    printf("%d   ", x);
    x--;
}while(x >7);
```

16. **(16 pts)** What would be printed by the following C program segment?
```
{
    int num[4] = {1, 2, 3, 4};
    int *p = num;
    int *q = num+2;
    int *r = &num[1];
    printf("%d %d\n", num[1], *(num+1));    // (2 pts)
    printf("%d %d\n", *p, *(p+1));          // (4 pts)
    printf("%d %d\n", *q, *(q+1));          // (4 pts)
    printf("%d %d\n", *r, *(r+1));          // (6 pts)
}
```

17. **(10 pts)** Rewrite the following C program segment using a **for** loop.
```
x = 10;
do{
    printf("%d   ", x);
    x++;
}while(x <20);
```