1. (12%) Please explain and give an example of a **unicast IP address**, a **multicast IP address**, and a **broadcast IP address**.

2. (a) (5%) Please explain the difference between the “syntax error” and the “semantic error”.
   
   (b) (6%) The following C codes compute \(1+2+3+...+n\). Point out all the “syntax” and “semantic” errors.
   
   ```c
   void sum (int n)
   {
       return n\*n/2;
   }
   ```

3. (10%) What is the status of a process in each of the following situations (according to the following figure)?
   
   a. The process is using the CPU.
   
   b. The process has finished printing and needs the attention of the CPU again.
   
   c. The process has been stopped because its time slot is over.
   
   d. The process is reading data from the keyboard.
   
   e. The process is printing data.

**Program**

![Diagram of process states](image-url)
4. (4%) Convert the following number from binary to hexadecimal:
   i. 1011011101
   ii. 101010101010

5. (4%) Convert the following numbers from hexadecimal to decimal:
   i. 7F
   ii. FE01

6. What is the File Transfer Protocol (FTP)? (3%) How does it work? (3%)

7. Explain and compare TCP and UDP. The protocol FTP uses TCP while DNS uses UDP. Why? (6%)

8. (8%)
   The Fibonacci series
   0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ....
   begins with the terms 0 and 1 and has the property that each succeeding term is
   the sum of the two preceding terms.
   (a) write a non-recursive function Non_Fibonacci(n) which calculates the nth
       Fibonacci number.
   (b) write a recursive function Re_Fibonacci(n) that calculate the nth Fibonacci
       numbers).

9. (6%)
   Please determine the final value of each variable after all statements are
   performed.
   x = y = z = 3;
   x* = x++;
   y += ++x - x++;
   z = x++ * ++y
10. (a) Write a program that can sort a set of data from a file "data.dat" (20 %)

(b) Trace your program with the sample data of
   "25, 14, 37, 7, 19, 35, 41, 27, 38, 40" in the file "data.dat" (5%)

(c) Analyze the complexity of your program (8%)