



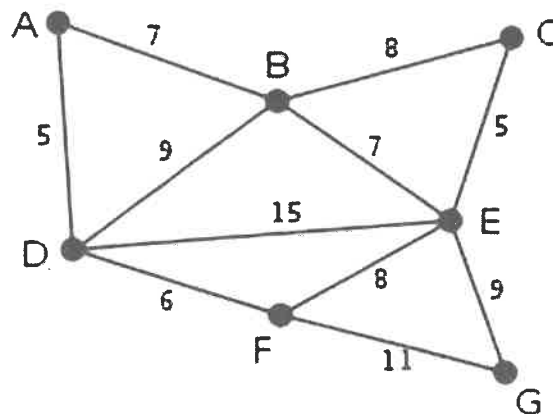
1. (5%) Consider the following recursive program code. What will happen when the code is compiled and executed?

```
void my_recursive_function()
{
    my_recursive_function();
}
int main()
{
    my_recursive_function();
    return 0;
}
```

2. (5%) How many times is the recursive function called, when the following code is executed?

```
void my_recursive_function(int n)
{
    if(n == 0)
        return;
    printf("%d ",n);
    my_recursive_function(n-1);
}
int main()
{
    my_recursive_function(10);
    return 0;
}
```

3. (10%) (a) Consider the following graph. Find the minimum spanning tree of the graph.  
 (5%) (b) Find all shortest distances from B to other nodes.





4. (10%) (a) Construct a Binary Search Tree by inserting the following sequence of numbers: 10,12,5,4,20,8,7,15 and 13.

(5%) (b) What is the visiting sequence of the depth-first search (DFS)?

5. (10%) A 12-bit Hamming code word containing 8 bits of data and 4 parity bits is read from memory. What was the original 8-bit data word that was written into memory if the 12-bit word read out is as follow: 010011101010

6. For a direct-mapped cache design with a 32-bit address, the following bits of the address are used to access the cache.

Tag	Index	Offset
31-10	9-4	3-0

(a) (5%) What is the size of each cache block (in bytes)?

(b) (5%) How many entries does the cache have?

(c) (5%) In the cache, how many bits are used to store tag information?

7. (5%) How does a compiler convert a high-level program into an executable file, which a computer can run? Please put the following items into the correct order.

(a) Translate the assembly program into binary instruction (object files)

(b) Compile the source file into an assembly language program

(c) Combine a collection of object and library files into an executable file

8. (10%) What is the average time to read a 512-byte sector for a typical disk rotating at 15,000 RPM (Revolutions Per Minute)? The average seek time is 4ms, the transfer rate is 100MByte/sec, and the controller overhead is 0.2 ms. Assume that the disk is idle so that there is no waiting time. (Hint: Average read time = seek time + rotational latency + transfer time + controller overhead)

9. (10%) Assume a system uses five protocol layers. If the application program creates a message of 200 bytes and each layer adds a header of 10 bytes to the data unit, what is the efficiency of the system? The efficiency is defined as the ratio of application-layer bytes to the number of bytes transmitted.

10. (10%) Three processes (A, B, C) are running concurrently. Process A has acquired File1 but needs File2. Process B has acquired File 3, but needs File 1. Process C has acquired File 2 but needs File3. Is this a deadlock situation? Please draw a diagram to explain these processes.