1. (5 pts) Which one of the following classes of the algorithms is the insertion sort algorithm in?
   A. $\Theta(\log_2 n)$ B. $\Theta(n)$ C. $\Theta(n \log_2 n)$ D. $\Theta(n^2)$

2. (5 pts) Which one of the following classes of algorithms is the binary search algorithm in?
   A. $\Theta(\log_2 n)$ B. $\Theta(n)$ C. $\Theta(n \log_2 n)$ D. $\Theta(n^2)$

3. (15 pts) Use C, C++, or JAVA to write a **recursive function** to compute the sum of the harmonic series $H_n = 1/1 + 1/2 + 1/3 + 1/4 + 1/5 + \cdots + 1/n$.

4. (15 pts) For the following graph, find a minimum spanning tree of it by the Kruskal's algorithm step by step.
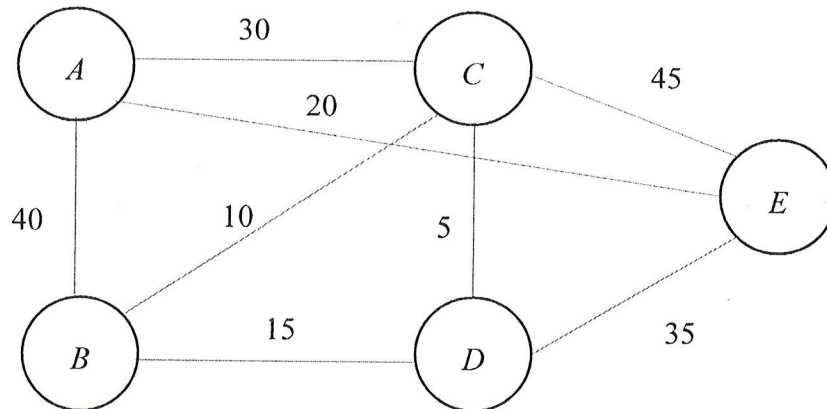
5. (10 pts) Let $T(n) = \begin{cases} 2T\left(\frac{n}{2}\right) + n, & n > 1 \\ 1, & n = 1. \end{cases}$

   Show that $T(n) = O(n \log n)$.

6. (12 points) Define each of the following terms.
   a) Algorithm
   b) Program
   c) Process

7. (8 points) What is the result of performing a left rotation by one bit on the following hexadecimal bit values? Please answer with a hexadecimal value.
   a) 0xAB
   b) 0x5C

8. (10 points) When an interrupt occurs, try to outline what steps the CPU will take?

9. (10 points) How many bits are needed to represent 1023 different bit patterns?

10. (10 points) Which of the following does not print the same sequence of numbers as the others?

A.
```
X = 5
while (X < 6):
    print(X)
    X = X + 1
```

B.
```
X = 4
while (X < 5):
    X = X + 1
    print(X)
```

C.
```
X = 5
repeat:
    print( X)
    X = X + 1
until (X > 6)
```