SOLVE EXACTLY THREE OUT OF THE FOLLOWING FIVE PROBLEMS:

1. 1) Show the result of the following heap after insert 17.

```
    15
   / \    
  23   18
 /     /    
27  34  22  60
 /     /    
65  29  38
```

2) Show the result of the heap obtained in (1) after deleting the root.

2. Suppose $T(N)$ is the average running time for the quicksort of the data of size $N$.

Find a closed formula for $T(N)$

3. Sort 3, 24, 25, 9, 2, 16, 15, 3, 5 using quick sort with medium of three partitioning and a cut off of 3.

4. Give an algorithm to find a minimum spanning tree, suppose the undirected graph is represented by an adjacency list.
5. The following pseudocode is applied to the adjacent list of the graph H with the adjacency list given on the next page.

```plaintext
counter = 0;
assign (A);

void assign (Vertex v)
    {vertex w;
     v.num=counter +1;
     v.visited = true;
     for each w adjacent to v
     if (! w.visited)
     {w.parent = v;
     assign (w);
     }
     }
```

a) What is the result?
The adjacency list of the graph H:

\[
\begin{align*}
A & \rightarrow C \rightarrow D \\
B & \rightarrow C \rightarrow D \rightarrow G \\
C & \rightarrow A \rightarrow B \rightarrow G \\
D & \rightarrow A \rightarrow B \\
E & \rightarrow F \rightarrow G \\
F & \rightarrow E \rightarrow G \\
G & \rightarrow B \rightarrow C \rightarrow E \rightarrow F
\end{align*}
\]

b) What is the running time if the adjacency list has \( N \) nodes?