1. Given the following array of character keys:
   (E, A, S, Y, Q, U, I, Z)
   - Show the steps of building up a maximum heap for that array using the Heapify algorithm.
   - What is the number of comparisons used in building this heap?

2. What is the complexity (Big-O) of insertion in a minimum heap if:
   - All keys are equal?
   - Keys are already sorted in ascending order?
   - Keys are already sorted in decreasing order?

3. Design an algorithm to find the kth smallest element in an array of size (n) using a minimum heap. What will be the complexity of such algorithm in the worst case?

4. An example of problem reduction is calculating the Least Common Multiple of two positive integers \(m\) and \(n\) denoted by \(lcm(m, n)\). It is defined as the smallest integer divisible by both \(m\) and \(n\) (e.g. \(lcm(24, 60) = 120\)). By problem reduction, we can compute the \(lcm\) using the Greatest Common Divisor \(gcd(m, n)\):
   \[lcm(m, n) = \frac{m \cdot n}{gcd(m, n)}\]
   where the \(gcd(m, n)\) can be computed by Euclid’s algorithm.
   Find the complexity of computing the \(lcm\) using this reduction method.

5. Apply Horner’s rule to convert 110100101 from binary to decimal.

6. Consider the following graph:
   Represent it as an adjacency matrix \(A\) and find its square \(A^2\) to count the paths of length 2 between its respective vertices.