

dmurad2.tex

Homework 3

September 2024

## 1 Question 1

Traverse the binary tree

Preorder Traversal

*Answer :a, b, d, e, c, f*

Inorder Traversal

*Answer :d, b, e, a, c, f*

## 2 Question 2

Pseudocode

Preorder Traversal

```
1: function PREORDER(node)
2:   if node  $\neq$  null then
3:     Print(node.value)
4:     PREORDER(node.left)
5:     PREORDER(node.right)
6:   end if
7: end function
```

Inorder Traversal

```
1: function INORDER(node)
2:   if node  $\neq$  null then
```

```

3:     INORDER(node.left)
4:     Print(node.value)
5:     INORDER(node.right)
6:   end if
7: end function

```

### Postorder Traversal

```

1: function POSTORDER(node)
2:   if node ≠ null then
3:     POSTORDER(node.left)
4:     POSTORDER(node.right)
5:     Print(node.value)
6:   end if
7: end function

```

## 3 Question 3

**function** METHOD( $x, y$ )  
**Input:** Two  $n$ -digit numbers  $x$  and  $y$ , where  $n = 2^k$   
**Output:**  $x \cdot y$   
**if**  $n = 1$  **then**  
     **return**  $x \cdot y$   
**else**  
      $m \leftarrow n/2$   
      $x_l, x_r \leftarrow$  split  $x$  into two halves  
      $y_l, y_r \leftarrow$  split  $y$  into two halves  
      $P_1 \leftarrow$  METHOD( $x_l, y_l$ )  
      $P_2 \leftarrow$  METHOD( $x_r, y_r$ )  
      $P_3 \leftarrow$  METHOD( $x_l + x_r, y_l + y_r$ )  
     **return**  $P$   
**end if**  
**end function**

## 4 Question 4

(a)  $T(n) = 4T(n/2) + n, T(1) = 1$

$$T(n) = \Theta(n^2)$$

(b)  $T(n) = 4T(n/2) + n^2, T(1) = 1$

$$T(n) = \Theta(n^2 \log n)$$

(c)  $T(n) = 4T(n/2) + n^3, T(1) = 1$

$$T(n) = \Theta(n^3)$$