



**Higher National Diploma in Information Technology**  
**Second Year First Semester Examination – 2022**  
**HNDIT 3032 – Data Structures and Algorithms**

**Instructions:**

Answer any four (04) questions  
Every question carry 25 marks

No. of questions: 05  
No. of pages : 03  
Time : Two hours

**Question 01**

**(Total Marks 25)**

- i) What is the Data Structure? (03 Marks)
- ii) What is ADT? Give two examples of ADT (2 + 2 = 04 Marks)
- iii) Write a Java method to check the User input string is a **palindrome or Not using a loop**. (Hint: **palindrome word is civic**) (07 Marks)
- iv.) Write a Java method to **find Maximum Number in 10 unsigned integers** an Array (07 Marks)
- v.) Find the **Big O** of the given equation  $F(n)=n^3+4n^2+5$  (04 Marks)

**Question 02**

**(Total Marks 25)**

- i.) Consider following Java code and Write a Java method to add two metrics (**metricsA**, **metricsB**) and display it as a Metrics .

```
int metricsA[][]={{10,12,13},{11,15,16},{20,21,23}};  
int metricsB[][]= {{14,9,8},{1,2,3},{60,71,73}};
```

(08 Marks)

- ii.) Compare and Contrast LINKED List Vs an Array (04 Marks)
- iii.) Write Four Operation in LINKED LIST (04 Marks)
- iv.) Write a Java code to define a Linked List data structure using Java Classes (05 Marks)
- v.) Write a pseudo code appending Node in LINKED LIST (04 Marks)

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**Question 03****(Total Marks 25)**

i.) Consider following Java coding in Queue implementation Java Program.

```
public class ArrayQueue {
    public int size;
    int front, rear;
    public int[] que = new int[size];
    public ArrayQueue(int size, int[] arr) {
        this.size = size;
        this.que = arr;
        front = -1;
        rear = -1;
    }
    public int getSize() {
        return size;
    }
    public int[] getQue() {
        return que;
    }
}
```

- a.) Write a reason why take two variables **rear** and **front** implementing Queue data structure. (04 Marks)
- b.) Write Java Method to represent enqueue operation in a queue (04 Marks)
- c.) Briefly explain why circular queue representation is introduced. (05 Marks)

ii) What is STACK? Discuss the LIFO behavior of a STACK. (03 Marks)

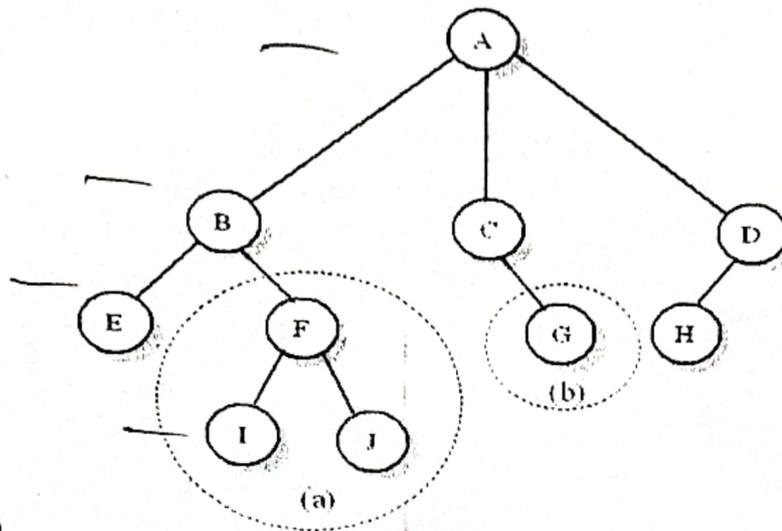
iii.) Graphically illustrate Following operation in STACK implementation, its **size is 4**

- a.) Empty STACK  
b.) x = isEmpty();  
c.) push(10);  
d.) Push(12);  
e.) push(15);  
f.) y = pop();  
g.) push(90);  
h.) push(100);  
j.) z = isFull();

**(09 Marks)**

Question 04

(Total Marks 25)



i.) Consider the above diagram

a.) Define the parent node. Give an example. ~~✗~~ (02 Marks)

b.) What is **Height** of a Tree ~~✗~~ (02 Marks)

c.) Define the leaf nodes. Give two examples. ~~✗~~ (03 Marks)

d.) Write a Path From **root to J** ~~✗~~ (02 Marks)

ii.) Define the Binary Search Tree (BST) (04 Marks)

iii.) Insert given Number Set in to **BST** (23,33,45,30,10,55,15,8,42,17) (05 Marks)

iv.) What is **Selection short** (02 Marks)

v.) Mentions the steps to Sort the given numbers 6, 7,72, 4, 32, 65, 9, 56 using **Bubble sort** (05 Marks)

Question 05

(Total Marks 25)

i.) What is search algorithm? Briefly explain the two types of searching Algorithms (2+2\*2 = 06 Marks)

ii.) Write a Java code to Sequential/Linear Search (05 Marks)

iii.) Write a Java program to search 99 in a following Array using Sequential/Linear Search  
`int num[] = {4, 65, 2, -31, 0, 99, 2, 83, 782, 1};` (05 Marks)

iv.) Discuss Efficiency of Sequential/Linear Search and Binary search algorithm (04 Marks)

v.) "**Selection sort algorithm** is better than **bubble sort algorithm**". Do you agree? Justify your answer (05 Marks)