SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION
(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology
Second Year, First Semester Examination – 2023
HNDIT3032 – Data Structure and Algorithms

Instructions for Candidates:	No. of questions: 05
answer four (4) questions only	No. of pages : 03
	Time : 02 hours

Question 01

i. What is an algorithm? List two properties of a good algorithm. (04 marks)

ii. What is an abstract data type? Give two user defined abstract data types. (05 marks)

iii. Define Linear and Non-Linear Data Structures with an example. (04 marks)

iv. Write a Java program to initialize an array with vowels and display its elements in the reverse order. (06 marks)

v. Describe the following cases of Analyzing the algorithms according to the Big O notation.

   a) Best case (03 Marks)

   b) Worst case (03 Marks)

Question 02

i. Define the Stack? (03 marks)

ii. Define the following terms
   a) Stack Overflow (03 marks)
   b) Dynamic implementation (03 marks)

iii. Illustrate the graphical representation of following operations in stack. Consider the size of array is 5.

   a) initializeStack() (01 mark)

   b) push(x) (01 mark)

   c) push(y) (01 mark)

   d) n=pop() (01 mark)

   e) push(p), push(t) (01 mark)

   f) A = isfull() (01 mark)

iv.   Write algorithms to perform following operations for the static array.

    a) Pop ()

                                                        (03 marks)

    b) Push (x)

                                                        (03 marks)

v.   State two difference between array and Linked List   (04 marks)

Question 03

i.)   Write a Java program to input following values to a Two-Dimensional array and print them.

    10, 50, 55, 87,45

    12, 54, 67, 98,47

    21,34, 64, 93, 78   (06 marks)

ii.)   Describe two applications of queue in computer.   (02 marks)

iii.) What are the two implementations method of a queue? Briefly describe them

                                                       (04 marks)

iv.)   Consider following java code.

```java
import java.util.Scanner;
public class ArrayQuequ {
public int size;
int front,rear;
public int que[]=new int[size];
public ArrayQuequ(int size, int[] arr) {
super();
this.size = size;
this.que = arr;
front=-1;
rear=-1;}
public int getSize() {
return size;}
public int[] getQue() {
return que;}
```
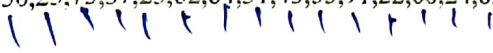
Write java program code to implement following operations in a queue.

                                                        (04 marks)

a) Enqueue (x)

                                                        (04 marks)

b) Dequeue ()

v) "To avoid the insertion problem in a static queue we can introduce the circular queue" Do you agree with this statement? Justify your answer. (05 Marks)

Question 04

i. Describe two applications area of Tree Data Structure (02 marks)

ii. Briefly explain following terminologies in tree data structure
   a. Sibling
   b. Leaf
   c. Height of the tree (06 marks)

iii. Insert the following data set into a binary search tree.
   50,25,75,37,23,62,84,31,43,55,91,22,66,24,82 (07 marks)

iv. State how node is traverse according to the given techniques in the following binary search tree.
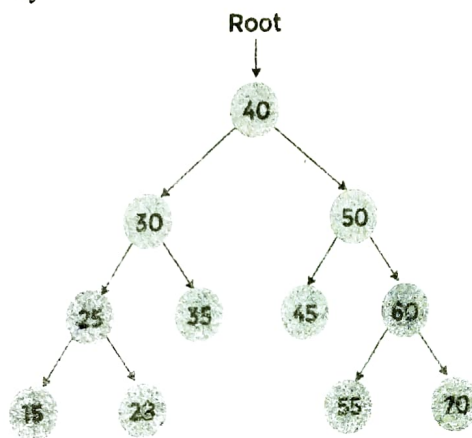
   a) In-order traversal
   b) Pre-order traversal (06 marks)

v. Mention the advantages and disadvantages (if any) of binary search over sequential search. (04 marks)

Question 05

i. Why need Algorithm Analysis? (03 marks)

ii. What is the difference between time complexity and space complexity? (06 marks)

iii. Write a java code to implement the Sequential sort algorithm (06 marks)

iv. Consider following unsorted number list and sorted using selection sorting algorithm.

   14, 33, 27,10,35,19 . (06 marks)

v. Differentiate the Insertion sort and Bubble sort (04 marks)