Date of Examination
18-11-2022

No of Questions	04
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GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY

BACHELOR OF SCIENCE (HONS) IN INFORMATION TECHNOLOGY/ INFORMATION SYSTEMS DEGREE

INTAKE 38 - 4TH SEMESTER EXAMINATION – 2022 NOVEMBER/DECEMBER

(Stream - IT/IS)

DATA STRUCTURES AND ALGORITHMS

(IT 2093)

Instructions: **Duration:03 Hours**

Answer **ALL** questions.
All the questions carry **equal marks**.

Question 01 **(25 marks)**

a. Define "Data Structure" in computing and explain the two main types. (07 marks)

b. Briefly explain four characteristics of an algorithm. (08 marks)

c. Identify and describe the structure of an algorithm using an example. (10 marks)

Question 02 **(25 marks)**

a. Explain what is meant by the "Order" (i.e., big-O notation) of an algorithm. (07 marks)

b. Find the time complexity of the below program:

```
function(int n)
{
  if (n==1)
    return;
 for (int i=1; i<=n; i++)
   {
     for (int j=1; j<=n; j++)
      {
        printf("*");
        break;
      }
    }
}
```

(08 marks)

c. Write a recursive Java code that takes a positive number *n* as its parameter and returns the n^{th} Fibonacci number. (10 marks)

Question 03 **(25 marks)**

a. Compare and contrast the linear search and binary search algorithms by searching for the numbers 56 and 92 in the following list:
[37 53 86 92 110] (09 marks)

b. Differentiate between the way a bubble sort works from the way a selection sort works. Use an example [7 3 8 2 9 6] to illustrate each case. (08 marks)

c. Illustrate the resulting stack after executing the following operations on an empty stack. Indicate all intermediate steps.

```
push(5)
push(6)
pop()
push(7)
push(8)
pop()
push(5)
push(4)
```

(08 marks)

Question 04 **(25 marks)**

a. Compare and contrast the characteristics of a Linked List and an Array. (05 marks)

b. Write a Java program to create a linked list and add a node to the head of the linked list. (10 marks)

c. Write a Java program to perform the following operations for a Queue.

i. Add an element to the queue.

ii. Delete an element from the queue. (10 marks)

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