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
First Year, Second Semester Examination-2016
HNDIT1211: Data Structures and Algorithms

Instructions for Candidates:
Answer four (04) questions only.

No. of questions : 05
No. of pages : 04
Time : Two hours

Question 01

a. What is Data Structure? (03 Marks)

b. Compare Linear and Nonlinear Data Structures by giving two (02) examples for each Data Structure. (04 Marks)

c. Briefly explain the following terms.

i. Algorithm

ii. Big O Notation

iii. Best Case Efficiency

iv. Worst Case Efficiency

v. Average Case Efficiency (05 Marks)

d. Write C++ code to initialize an array with 10 characters (A…J) and print them in reverse order. (06 Marks)

e. Write C++ code to create the following two dimensional array and display its elements.

5	3
8	4
2	6
7	4

(07 Marks)

Question 02

a. Define Stack Data Structure and mention two (02) ways of implementing Stack. (03 Marks)

b. Graphically illustrate the following stack operations sequentially.

i. initializeStack()

ii. push(a)

iii. push(b)

iv. x = pop( )

v. push(c)

vi. push(d)

vii. y = topElement()

viii. push(e) (04 Marks)

c. Graphically illustrate the implementation of the following stack operations.

i. initializeStack()

ii. push(p)

iii. push(q)

iv. x = pop()

v. y = topElement( ) (05 Marks)

d. Write down C++ code for implementing the following operations in stack.

i. push( )

ii. pop( )

iii. isEmpty() (06 Marks)

e. Match the following stack operations with the corresponding linked list operations.

	Stack Operation		***Linked List Operations***
i.	initializeStack()	A	insertAtFront()
ii.	push()	B	firstElement()
iii.	pop()	C	initializeList()
iv.	topElement()	D	isEmpty()
v.	isEmpty()	E	deleteFirstElement()
vi.	isFull()	F	displayList()
vii.	displayStack()	G	isFull()

(07 Marks)

Question 03

a. Queue is an abstract data type (ADT). Explain briefly (03 Marks)

b. Diagrammatically illustrate the following Queue Operations.

i. initializeQueue()

ii. p = isEmpty()

iii. enQueue(A)

iv. enQueue(B)

v. enQueue(C)

vi. x = deQueuer()

vii. y = frontElement()

viii. displayQueue() (04 Marks)

c. Diagrammatically illustrate the implementation of the following queue operations.

i. initializeQueue()

ii. enQueue(l)

iii. enQueue(m)

iv. x = deQueue()

v. enQueue(n) (05 Marks)

d. Write C++ code for the following functions of queue

i. Inserting an item to a queue

ii. Removing an item from a queue

iii. Displaying all items of a queue (06 Marks)

e. Match the following Queue operations with the corresponding Linked List Operations.

	Queue Operation		***Linked List Operations***
i.	initializeQueue()	A	deleteFirstElement()
ii.	enQueue()	B	firstElement()
iii.	deQueue()	C	initializeList()
iv.	frontElement()	D	isEmpty()
v.	isEmpty()	E	isFull()
vi.	isFull()	F	displayList()
vii.	displayQueue()	G	insertAtRear()

(07 Marks)

Question 04

a. Briefly explain the following terms related to tree data structure with the help of diagrams.

i. Tree

ii. Root of a Tree

iii. Parent of a Node

iv. Children of a Node

v. Siblings of a Node

vi. Leaves of a Tree (03 Marks)

b. Define the following terminologies related to tree data structure.

i. Size of a Tree

ii. Depth of a Node

iii. Height of a Tree

iv. Degree of a Node (04 Marks)

c. Explain the following special trees

i. Binary Tree (02 Marks)

ii. Binary Search Tree (03 Marks)

d. Insert the following data set into a binary search tree.

13, 3, 4, 12, 14, 10, 5, 1, 8, 2, 7, 9 (06 Marks)

e. Diagrammatically explain the implementation of a Binary Tree. (07 Marks)

Question 05

a. What is meant by sorting?

Give two (2) sorting algorithms other than Bubble Sorting. (03 Marks)

b. Sort the following data set 5, 1, 4, 2, 8 using Bubble Sort method. Show your work.(04 Marks)

c. Briefly explain the following terms.

i. Searching (01 Marks)

ii. Sequential Searching (02 Marks)

iii. Binary Searching (02 Marks)

d. Give C++ implementation for Sequential Search. (06 Marks)

e. Give C++ implementation for Binary Search. (07 Marks)