NATIONAL SCHOOL OF BUSINESS MANAGEMENT
1st Year 2nd Semester Special Examination
12-September-2019
CS106.3 – Data Structures and Algorithms

Instructions to Candidates

1) This paper consists of 2 sections. Answer ALL questions.

2) Time allocated for the examination is three (03) hours.

3) Total number of pages - Seven (07)

4) If a page or a part of this question paper is not printed, please inform the Supervisor immediately.

5) Write your index number in all pages of answer script.

6) Staple all answer sheets at the end of the examination.

Part A: Multiple Choice Questions. Select the appropriate answer. Answer sheet is attached at the end of the MCQ question set. (20 mark)

1. Two main measures for the efficiency of an algorithm are

   a. Processor and memory
   b. Complexity and capacity
   c. Time and space
   d. Data and space
   e. None of the above

2. The searching technique that takes O (1) time to find a data is

   a. Insertion to unordered array
   b. Insertion to ordered array
   c. Deletion in unordered array
   d. Deletion in ordered array
   e. None of the above

   Hashing

3. You have to sort a list L consisting of a sorted list followed by a few "random" elements. Which of the following sorting methods would be especially suitable for such a task?

   a. Bubble Sort
   b. Quick Sort
   c. Insertion Sort
   d. Merge Sort
   e. Selection Sort

4. Let the following circular queue can accommodate maximum six elements with the following data

   front = 2   rear = 4
   queue = _____;   L, M, N, ___, ___

   What will happen after ADD O operation takes place?

   a. front = 2   rear = 5
   b. front = 2   rear = 4
   c. front = 3   rear = 5
   d. front = 3   rear = 4
   e. front = 3   rear = 6

5. The quick sort algorithm exploit _____ design technique

   a. Divide & Conquer
   b. Dynamic Programming
   c. Greedy
   d. Backtracking
   e. Snow Ball

6. Which data structure is used for implementing recursion?

   a. Stack
   b. Queue
   c. list
   d. Linked List
   e. Linear Queue

7. Linked lists are best suited

a. for relatively permanent collections of data

b. for the size of the structure and the data in the structure are constantly changing

c. for fixed size memory

d. For all the above situations

e. Cannot be apply to any of the above situations

8. Each node in a linked list has two pairs of .... and ....

a. Link field and information field
b. Link field and Next field
c. Data field and information field
d. Address field and link field
e. None of the above

9. Which of the following name does not relate to stacks?

a. LIFO
b. FILO
c. FIFO
d. PUSH-DOWN
e. None of the above

10. In a queue, the initial values of front pointer f rare pointer r should be …….. and ……….. respectively.

a. 0 and 1
b. 1 and 0
c. 0 and -1
d. -1 and 0
e. None of the above

01	a	b	c	d	e
02	a	b	c	d	e
03	a	b	c	d	e
04	a	b	c	d	e
05	a	b	c	d	e
06	a	b	c	d	e
07	a	b	c	d	e
08	a	b	c	d	e
09	a	b	c	d	e
10	a	b	c	d	e

Part B: Structured Essay Questions. Write down answers on a separate paper. (80Mark)

01.

a. Why Stacks are called "LIFO" structures and Queues are called "FIFO" structures.

If required make a graphical representation. (10 mark)

b. Briefly explain the advantage of circular queue over liner queue. How can you implement a circular queue? (6 mark)

c. Suppose an initially empty queue Q has performed a total of 32 enqueue operations, 10 front operations and 15 dequeue operations. What would be the current size of the queue? (No of elements in the current queue) (4 mark)

02.

a. Apply main searching algorithms that you have learnt and diagrammatically represent how these algorithms will perform on the following elements: If Search Key = 8

(10 mark)

23	35	12	8	80	3	17

b. Write a recursive function bSearch(A, low, high, searchKey) that performs binary search to return the index of the searchKey of the elements in array A starting at index low and ending at high. (7 mark)

c. Briefly explain where you may apply above searching algorithms and describe their complexities in terms of big O notation. (3 mark)

03.

a. Briefly explain bubble sort and selection sort algorithms? (8 mark)

b. Diagrammatically perform the bubble sort on the following array. (5 mark)

29	10	14	37	13

4

c. Sort the following sequence of keys using merge sort. (4 mark)
66, 77, 11, 88, 99, 22, 33, 44, 55

d. Briefly explain the concept behind "Quick Sort" algorithm. (3 mark)

04.

Tree data structure is an extension of linked list structure.

a. Draw a Binary tree structure on your own and identify below elements. (5 mark)

I. Root

II. Siblings

III. Parent

IV. Child

V. Leaf Node

b. Insert the values **3, 2, 1, 4, 5, 6, 7, 16, 15** and **14** in that order into a **binary search tree.** Clearly show the intermediate steps. (5 mark)

c. For the above developed graph derive the below traversing output. (6 mark)
In order, Pre order and Post order output.

d. Based on the resultant tree of (b) explain how to search for value "6". (4 mark)

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