Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2019

CA5CO08 Data Structures

Programme: MCA Branch/Specialisation: Computer Application

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. If a variable is a pointer to a structure, then which of the following operator is used to access data members of the structure through the pointer variable? **1**

(a) . (b) & (c) * (d) →

ii. Which of the following statement is false? **1**

(a) Arrays are dense lists and static data structures.

(b) Data elements in linked list need not be stored in adjacent space in memory.

(c) Pointers store the next data element of the list.

(d) Linked lists are collection of the nodes that contain information part and next pointer.

iii. Convert the infix to postfix for: **1**

A-(B+(C)*(D/E)

(a) ABC+DE/*- (b) ABC-DE/*-

(c) ABC-DE*/- (d) None of these

iv. What happens if base condition is not defined in the recursion? **1**

(a) Stack Underflow (b) Stack Overflow

(c) Both (a) and (b) (d) None of these

v. "p" and "q" are pointers to a node of the linked list, "head" points to the first node of the list, next points to the "next" node in the list. Which of the following is true for the following piece of code? **1**

```
for( p = head, q = head ; p != NULL ; q = p) {
     p = p→next;
     free(p);
}
```

P.T.O.

(a) Deletes all nodes (b) Deletes all but not the last node
(c) Does not delete any node (d) Program will crash

vi. A linear list of elements in which deletion can be done from one end (front) and insertion can take place only at other end (rear) is known as: **1**
(a) Queue (b) Stack (c) Tree (d) Linked List

vii. What is the worst case performance of selection sort algorithm: **1**
(a) O(log n) (b) O(n*n) (c) O(n) (d) O(n log n)

viii. In binary search, average number of comparison required for searching an element in a list of n numbers is: **1**
(a) $\log_2 n$ (b) n/2 (c) n (d) n-1

ix. For a given graph G having v vertices and e edges which is connected and has no cycles, which of the following statements is true? **1**
(a) v = e (b) v = e+1 (c) v + 1 = e (d) None of these

x. What is a hash table? **1**
(a) A structure that maps values to keys
(b) A structure that maps keys to values
(c) A structure used for storage
(d) A structure used to implement stack and queue

Q.2 i. What do you mean by abstract data type. **2**

ii. Differentiate between row major and column major address calculation. **3**

iii. Write a function to a perform multiplication of two matrices. **5**

OR iv. What is a data structure? What are the factors that influence the choice of a particular data structure? **5**

Q.3 i. Define static and non-static data structures. **2**

ii. Define Stack and write the ADT of stack. Implement push and pop functions for stack using arrays with overflow and underflow conditions. **8**

OR iii. Write the postfix form of the following expression using stack. **8**
(a) (a + b) * d + e / (f + a * d) + c
(b) ((a / (b – c + d)) * (e – a) * c)

Q.4 i. What is queue? Is queue a linear or non-linear data structure? What are the limitations of the linear queue? **3**

ii. Write c function to perform the following in doubly linked list. **7**
(a) Inserting a node at the beginning.
(b) Deletion of a node with a given value.
(c) Search a key element.

OR iii. Give the node structure to create a linked list of integers and write C functions to perform the following: **7**
(a) Create a 3 node list with data 10, 20 and 30.
(b) Insert a node with the data value 15 in between the nodes having data values 10 and 20.
(c) Delete the node whose data is 20.

Q.5 i. What is hash function? What should be characteristics of a good hash function? **4**

ii. Write function for binary search and describe the analysis of it. **6**

OR iii. Write Quick sort algorithm and describe the analysis of it. **6**

Q.6 Attempt any two:

i. For a binary tree T, the pre-order and in-order traversal sequences are as follows: **5**

Pre-order :	A	B	L	M	K	N	P	Q
In-order :	L	B	M	A	N	K	Q	P

Draw the binary tree.

ii. How graphs can be represented in computer memory. Give relative merits and de-merits of each representation scheme. **5**

iii. How an AVL tree differs from a binary search tree? How AVL trees are represented in computer memory? **5**

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Marking Scheme
CA5CO08 Data Structures

Q.1 i. If a variable is a pointer to a structure, then which of the following operator is used to access data members of the structure through the pointer variable? **1**
(d) →

ii. Which of the following statement is false? **1**
(c) Pointers store the next data element of the list.

iii. Convert the infix to postfix for: **1**
A-(B+(C)*(D/E)
(a) ABC+DE/*-

iv. What happens if base condition is not defined in the recursion? **1**
(b) Stack Overflow

v. "p" and "q" are pointers to a node of the linked list, "head" points to the first node of the list, next points to the "next" node in the list. Which of the following is true for the following piece of code? **1**

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(a) Deletes all nodes

vi. A linear list of elements in which deletion can be done from one end (front) and insertion can take place only at other end (rear) is known as: **1**
(a) Queue

vii. What is the worst case performance of selection sort algorithm: **1**
(b) O(n*n)

viii. In binary search, average number of comparison required for searching an element in a list of n numbers is: **1**
(a) $\log_2 n$

ix. For a given graph G having v vertices and e edges which is connected and has no cycles, which of the following statements is true? **1**
(b) v = e+1

x. What is a hash table? **1**
(b) A structure that maps keys to values

Q.2 i. Definition of abstract data type. **2**

ii. Row major address calculation 1.5 marks **3**
Column major address calculation. 1.5 marks

iii. Implementation of function to a perform multiplication **5**

OR iv. Definition of data structure 2 marks **5**
Factors that influence the choice of a particular data structure 3 marks

Q.3 i. Static and non-static data structures. **2**

ii. Define Stack 2 marks **8**
ADT of stack. 3 marks
Implement push and pop functions 3 marks

OR iii. Write the postfix form of the following expression using stack. **8**
(a) (a + b) * d + e / (f + a * d) + c 4 marks
(b) ((a / (b – c + d)) * (e – a) * c) 4 marks

Q.4 i. Queue 1 mark **3**
Is queue a linear or non-linear data structure 1 mark
Limitations of the linear queue 1 mark

ii. C function to perform the following in doubly linked list. **7**
(a) Inserting a node at the beginning. 2 marks
(b) Deletion of a node with a given value. 2.5 marks
(c) Search a key element. 2.5 marks

OR iii. Give the node structure to create a linked list of integers **7**
Implementation of function

Q.5 i. Hash function 2 marks **4**
Characteristics of a good hash function 2 marks

ii. Function for binary search 2 marks **6**
Analysis of it 4 marks

OR iii. Quick sort algorithm 2 marks **6**
Analysis of it. 4 marks

Q.6 Attempt any two:

i. Draw the binary tree. **5**
Numerical complete solution expected

ii. Graphs can be represented in computer memory **5**
2 marks
Merits and de-merits 3 marks

iii. AVL tree differs from a binary search tree 2 marks **5**
AVL trees are represented in computer memory
3 marks

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