No of Pages : 3 **Course Code : 18MX14**

Roll No:
(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, JANUARY 2019

MCA Semester : I

18MX14 DATA STRUCTURES

Time : 3 Hours **Maximum Marks : 100**

INSTRUCTIONS:

1. Answer **ALL** questions. Each question carries 25 Marks.
2. Course Outcome : Table

Qn.1	CO.1	Qn.2	CO.2	Qn.3	CO.3	Qn.4	CO.4.

1. a) Define Big O. How is it related to algorithm computational complexity? Indicate the complexity of the following code segments using Big O notation. (5)

```
i). for ( j = n/2; j ≤ n; j++)
      for( k =1; k ≤ n; k = 2 * k)
          for (m =1; m ≤ n ; m = m *2)
              count++
```

```
ii) for( k =1; k ≤ n; k = 2 * k)
      for( k =1; k ≤ n; k = 2 * k) {
          printf("#")
          break  }
```

b) i) What is Abstract Data type(ADT)? Define String ADT. (3)

ii) How are multi-dimensional arrays represented in storage? Write the addressing function for two dimensional matrix using each of these representations. Suggest an efficient way of storing the band matrix and write the corresponding addressing function. A band matrix of order 4 x 4 is shown below:

x	x	0	0
x	x	x	0
0	x	x	x
0	0	x	x

X denotes non-zero element of the matrix. (5)

c) Write recursive algorithms for i) linear and ii) Binary search. Write the corresponding recurrence relation. Solve the relation and represent the complexity using Big O notation. (12)

2. a) Write an algorithm to insert an element into a sorted singly linked list. (5)

b) i) Write the advantages and limitations of linked lists compared to arrays. (3)

ii) Write algorithms to i.Insert(DLL, P, elt) to insert an element next to the node pointed by P and ii. Delete(DLL, P) to delete node pointed by P in a doubly linked list. (5)

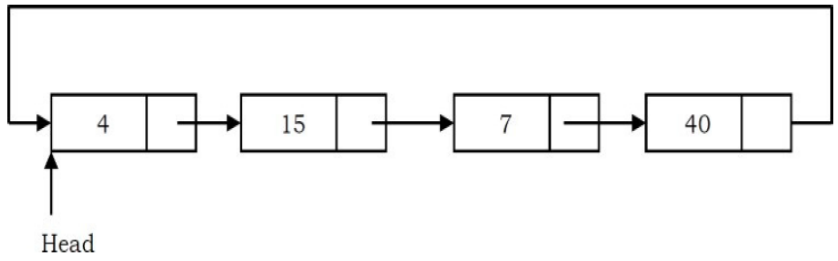
c) i) Suggest a way of representing polynomials using linked lists. Write an algorithm to add two such polynomials. What is the complexity of the algorithm?

(OR)

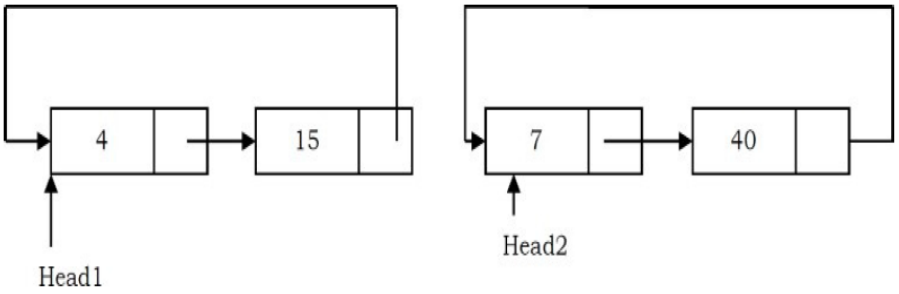
ii) Write algorithms for the following tasks:

1. Split the circular list into two equal parts. If the number of nodes in the list is odd, then make the first list one node extra than second list. (6)

Input



Output



2. Write an algorithm to reverse a single linked list. (6)

3. a) How do we implement two stacks using only one array? Write algorithms PushA(S,elt), PushB(S,elt), PopA(), PopB() for push and pop operations on both stacks. (5)

b) i) Write an algorithm to reverse the contents of a queue. Algorithms for the basic operations on the data structures need not be given. (3)

ii) Write an algorithm to evaluate a postfix expression. Trace the algorithm with the expression a b c + * d * , where a= 2, b = 3, c= 4 and d= 2 (5)

c) Write algorithms for the basic operations on linked queue. Given an integer k and a queue of integers, how do you reverse the order of the first k elements of the queue, leaving the other elements in the same relative order. (12)

Example : Input k=4, queue [10, 20, 30, 40, 50, 60, 70, 80, 90]

Output Queue [40, 30, 20, 10, 50, 60, 70, 80, 90]

4. a) Draw a binary tree whose inorder traversal sequence is H D J B E A F J C G and post order traversal sequence is H J D E B J F G C A. Write the sequence in which nodes are traversed in each of the traversal methods. (5)

b) i) What are the ways of representing graphs in storage? Which of these representations is best suited for the following tasks- checking whether pair of vertices are adjacent, listing all adjacent vertices of a given vertex. (3)

ii) Write Iterative algorithm for preorder traversal on binary trees. (5)

c) i) What is Hashing? What is the advantage and limitation of using Hashing to search an element in a collection? What is collision? Explain methods of resolving collisions. Consider a hash table of size 7 with hash function h(k)=k mod 7. Draw the table that results after inserting in the given order, the following values: 19, 26, 13, 48, 17. Resolve collisions using each of the collision resolving techniques discussed. (15)

(OR)

ii) Write algorithms for Breadth first and depth first traversal on graphs. Justify the choice of data structures used in the algorithms. Trace the algorithm on the graph shown in Fig 1. (15)

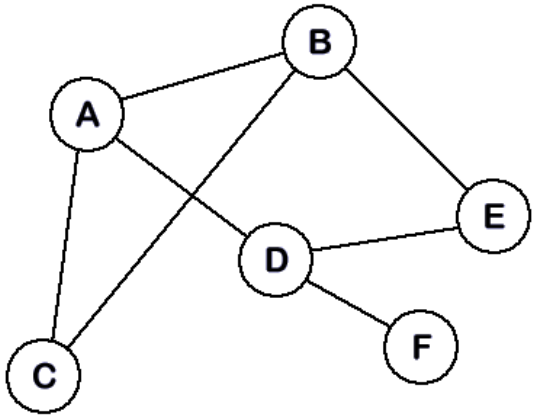


Fig 1

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