USN   17CS33

VI

ester B.E. Degree Examination, June/July 2019
Data Structures and Applications

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question front each module.

Module-1

1 a. Define Data structures. Give its classification_ What are the basic operations that can be performed on data structure? **(08 Marks)**

   b. Give the ADT for sparse matrix. Express the given sparse matrix in the triplet form and find its transpose.

$$A = \begin{vmatrix} 10 & 0 & 0 & 25 & 0 \\ 0 & 23 & 0 & 0 & 45 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 30 & 0 & 0 \end{vmatrix}$$

(08 Marks)

   c. Consider the given 2 polynomials,
      $A(x) = 4)(^{15} + 3x^4 + 5$ and $B(x) = x` + 10x^2 + 1$
      Represent the polynomials using Array of structures. **(04 Marks)**

OR

2 a. Explain the dynamic memory allocation functions in detail. **(08 Marks)**

   b. Write a C program using pointers to (i) Concatenate two strings, (ii) reverse a string. **(06 Marks)**

   c. Apply Knut-Morris-Pratt (KMP) pattern matching algorithm to search the pattern "abcdabcy" in the text "abexabcdabxabcdabcdabcy". **(06 Marks)**

Module_2

3 a. Define stack data structure and give the ADT for stack. Write C functions for push( ) and pop( ) operations. **(08 Marks)**

   b. Convert the given infix expressions to postfix and prefix expression.
      (i) $(a + b)* d + e / (f + g * h) + i$
      (ii) $((a / (b — c + d)) * (e — ⃰ g)$ **(06 Marks)**

   c. Write an algorithm for evaluation of postfix expression. Trace the same for the expression
      ab/c — de * t ac * t where a = 6, b = 3, c = 1, d = 2, e = 4. **(06 Marks)**

OR

4 a. Define recursion. Write C recursive functions for the following :
      (i) Tower of Hanoi   (ii) Factorial of a give number. **(07 Marks)**

   b. Write C functions for insertcq( ) and deletecq( ) operations on a circular queue. **(05 Marks)**

   c. Explain in detail multiple stacks, with relevant functions in C. **(08 Marks)**

Module-3

5 a. Define linked lists. Explain in detail, the primitive operations performed on Supply Linked List (SLL). List the different types of linked lists. **(12 Marks)**

   b. Write C functions for the following operations on Doubly Linked List (DLL).
      (i) Concatenation of two DLL.
      (ii) Search the DLL for the given key element. **(08 Marks)**

OR

6 a. Write a C program to implement linked stacks. **(08 Marks)**

   b. Write an algorithm to add 2 polynomials using circular simply linked list (SLL). And also represent the given polynomial using CSLL.
      $$P(x, y, z) = 6x^2y^2z - 4yz^5 + 3x^3yz + 2xy^5z - 2xyz'$$ **(08 *Marks)**

   c. For the given sparse matrix give the linked list representation.
      $$A = \begin{vmatrix} 0 & 0 & 4 & 0 & 0 \\ 6 & 5 & 0 & 0 & 0 \\ 0 & 3 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{vmatrix}$$ **(04 Marks**

Module-4

7 a. Define tree data structure. Represent the tree given in Fig.Q7(a) using (i) List representation (ii) Left-Child Right-Sibling representation (iii) Degree-two or Binary tree representation.
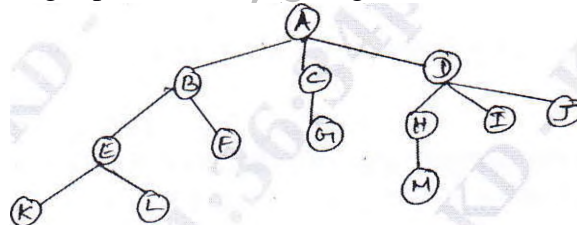

Fig.Q7(a) **(08 Marks)**

   b. Write recursive C functions for in-order, pre-order, post-order traversals of binary tree (BT). Also give the 3 traversals for the BT shown in Fig.Q7(b). **(12 Marks)**
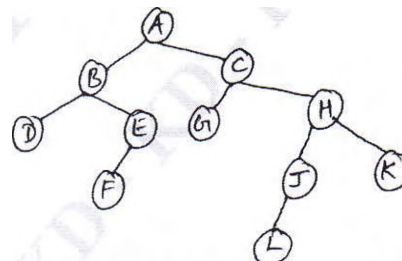

Fig.Q7(b)

OR

8 a. Define Binary Search Tree (BST). Construct BST for the element step-by-step, 100, 85, 45, 55, 110, 20, 70, 65, 113, 145, 132, 96 **(08 Marks)**

   b. Define threaded binary trees. Given in-order sequence: DJGBHEAFKIC and post-order sequence : JGDFIEBKIFCA, construct BT for the same. **(08 Marks)**

   c. Write an algorithm for deleting a key element from BST. **(04 Marks)**

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Module-5

9   a. Define the terminologies with example for graph data structure.
   (i) Graph   (ii) Multigraph   (iii) Complete graph.   **(06 Marks)**

   b. Give the adjacency matrix and adjacency list representation for the weighted graph given in Fig.Q9(b).   **(06 Marks)**
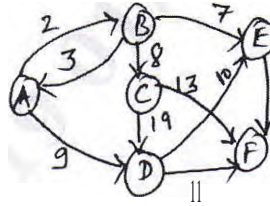

Fig.Q9(b)

   c. Write an algorithm for RFS and DFS graph traversal methods.   **(08 Marks)**

OR

10   a. Apply insertion sort technique for the following elements : 77, 33, 44, **11,** 88, 22, 66, 55.   **(08 Marks)**

   b.   Explain Hashing and collision. What are the methods used to resolve collision.   **(08 Marks)**

   c.   What are the basic operations that can be performed on a file? List the methods used for file organization (any 2).   **(04 Marks)**