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## Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. What is data structure? What are the various types of data structure? Explain. (05 Marks)
- b. What is structure? How it is different from array? Explain different types of structure declaration with examples and give differences between Union and Structure. (10 Marks)
- c. Define pointers. How to declare and initialize pointers, explain with example. (05 Marks)

### OR

- 2 a. Explain dynamic memory allocation functions in detail. (06 Marks)
- b. Write the Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'abcdabcy' in the text: 'abcxabcdabxabcdabcy' (08 Marks)
- c. Write a C program to:
  - (i) Comparing strings
  - (ii) Concatenate two strings (06 Marks)

### Module-2

- 3 a. Define stack. Give the implementation of push, pop and display functions. Include check for empty and full conditions. (07 Marks)
- b. Write the postfix form of the following expressions using stack:
  - (i)  $A \ \$ \ B \ * \ C \ - \ D \ + \ E \ | \ F \ ( \ G \ + \ H \ )$
  - (ii)  $A \ - \ B \ | \ ( \ C \ * \ D \ \$ \ E \ )$  (06 Marks)
- c. Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression.  $ABC - D * + E \$ F +$  and assume  $A = 6, B = 3, C = 2, D = 5, E = 1$  and  $F = 7$ . (07 Marks)

### OR

- 4 a. Define recursion. Write a recursive functions for the following:
  - (i) Factorial of a number
  - (ii) Tower of Hanoi (07 Marks)
- b. What is the advantage of circular queue over ordinary queue? Write a C program to simulate the working of circular queue of integers using array. Provide the following operations:
  - (i) Insert
  - (ii) Delete
  - (iii) Display (08 Marks)
- c. Write a note on Dequeue and priority queue. (05 Marks)

### Module-3

- 5 a. What is a linked list? Explain the different types of linked lists with neat diagram. (07 Marks)
- b. Write a C function to insert a node at front and delete a node from the rear end in a circular linked list. (08 Marks)
- c. Write a C function for the concatenation of two doubly linked lists. (05 Marks)

OR

- 6 a. Describe the doubly linked lists with advantages and disadvantages. Write a C function to delete a node from a circular doubly linked list with header node. (08 Marks)
- b. For the given sparse matrix, give the diagrammatic linked representation. (04 Marks)

$$a = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

- c. Write a C function to add two-polynomials represented as circular list with header node. (08 Marks)

**Module-4**

- 7 a. What is a tree? With suitable example, define:
- Binary tree
  - Level of the binary tree
  - Complete binary tree
  - Degree of the tree
- b. Write the C routines to traverse the tree using:
- Pre-order traversal
  - Post-order traversal.
- c. For the given data, draw a binary search tree and show the array and linked representation of the same: 100, 85, 45, 55, 110, 20, 70, 65. (05 Marks)

OR

- 8 a. What is the advantage of the threaded binary tree over binary tree? Explain the construction of threaded binary tree for 10, 20, 30, 40 and 50. (07 Marks)
- b. Define expression tree. For a tree given in Fig.Q8(b) traverse the tree using in-order, preorder and post-order traversals.

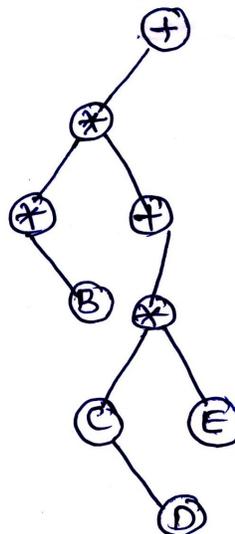


Fig.Q8(b)

- c. Construct a binary search tree by using the following in-order and preorder traversals:
- Inorder : BCAEDGHFI
- Preorder : ABCDEFGHI (06 Marks)

**Module-5**

- 9 a. Define graph. For the given graph, show the adjacency matrix and adjacency list representation of the graph [Ref. Fig.Q9(a)]

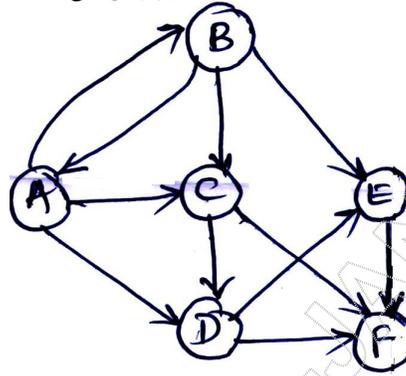


Fig.Q9(a)

- (05 Marks)
- b. What are the methods used for traversing a graph? Explain any one with example and write C function for the same. (08 Marks)
- c. Write a C function for insertion sort. Sort the following list using insertion sort:  
50, 30, 10, 70, 40, 20, 60 (07 Marks)
- OR**
- 10 a. What is collision? What are the methods to resolve collision? Explain linear probing with an example. (07 Marks)
- b. Explain in detail about static and dynamic hashing. (06 Marks)
- c. Briefly explain basic operations that can be performed on a file. Explain indexed sequential file organization. (07 Marks)

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