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Second Semester MCA Degree Examination, June/July 2015
Data Structures using C

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1**
- What is meant by static memory allocation and dynamic memory allocation? Write the syntax for dynamic memory allocation functions and explain with an illustration for each. Also explain the memory management process. (10 Marks)
 - Discuss the difference between structures and union, by taking the case of memory allocation with an illustration. (10 Marks)
- 2**
- Explain sparse matrices. Write an array representation of the following sparse matrix. Also denote the memory taken by both representation. Take elements of matrix as integers : (10 Marks)

$$A = \begin{bmatrix} 0 & 0 & 0 & 0 & 7 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 9 \\ 0 & 6 & 0 & 8 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 4 & 0 & 0 \end{bmatrix}$$
 - What is abstract data type? Write the ADT for linked list. (06 Marks)
 - Explain the classification of data structure and explain primitive and non-primitive data structures. (04 Marks)
- 3**
- Define stack as a dynamic data structure. Discuss PUSH and POP operations with function blocks. (08 Marks)
 - List and describe the operations to be performed on a queue. (04 Marks)
 - Convert the following expressions as indicated : (08 Marks)
 - $5 + (4 - 3) * 8$ infix to post fix
 - $++A - * \$ BCD / EF * GHI$ - prefix to infix (\$ - used for power).
- 4**
- Mention the difference between iteration and recursion. Write a program to find binomial coefficient (10 Marks)

$$n_{c_r} = \frac{n!}{(n-r)!r!}$$
 - Write a program in C, to evaluate post fix expression. (10 Marks)
- 5**
- Explain the basic operations to be performed on the linked list. Explain creation of linked list with an illustration. (10 Marks)
 - Develop a linked list in C, to store each term of a polynomial term with two variables. Also write the steps in tracing of addition of the following polynomials (snapshot of polynomial addition)
Poly 1 = $x + 8y^2 + 7xy^2 - 9y + 15$
Poly 2 = $8x^2y + 5x^2y^2 + 9y + 10y^2 + 3$. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, $42+8=50$, will be treated as malpractice.

- 6 a. Explain tree terminology with an illustration. (06 Marks)
- b. Explain complete binary tree. In a complete binary tree if the number of nodes t_n is known, then obtain the depth. Also find depth of in the following binary tree. (08 Marks)

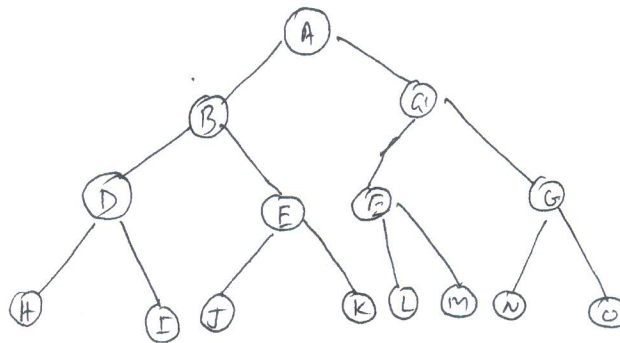


Fig. Q6(b)

- c. What is meant by threaded binary trees? Write an algorithm for traversing a threaded binary tree in INORDER. (06 Marks)
- 7 a. Write an algorithm in C to insert a new node at the specified position. (10 Marks)
- b. What is meant by double ended queue? write an algorithm in C, to
- Insert an element at the 'FRONT' end of the queue
 - Deletion of an element from the 'REAR' end of queue. (10 Marks)
- 8 Write short note on :
- Application of stack to keep track of function calls
 - Self-referential structures
 - Tower of Hanoi using recursion
 - Tree traversal techniques. (20 Marks)

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