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**Second Semester M.C.A Degree Examination, January/February 2005**  
**Master of Computer Applications**  
**Data Structures Using 'C'**

Time: 3 hrs.]

[Max.Marks : 100

**Note:** Answer any FIVE full questions.

1. (a) What is dynamic memory allocation? What are the advantages of dynamic memory allocation over static memory allocation? (5 Marks)
- (b) Write the syntax and explain with examples, the built-in functions of dynamic memory allocations. (10 Marks)
- (c) What are enumerated data types? How enumerated data types are declared and used in C programs. (5 Marks)
2. (a) Define data structure. Explain the different data structures. (8 Marks)
- (b) List out the advantages and disadvantages of arrays and linked lists. (6 Marks)
- (c) Distinguish between call by value and call by reference. (6 Marks)
3. (a) Convert the following infix expressions to postfix and prefix expressions. (8 Marks)
  - i)  $A * (B + C) * D$
  - ii)  $A/B - (C + D)^3 * E$
  - iii)  $B * C - D + E/F/(G + H)$
  - iv)  $((A + B) - ((C + D) * E)/F) * G$
- (b) Write a high level algorithm to convert a valid infix expression to postfix expression and trace the algorithm for the expression  $(A + B) * (C - D)$  (12 Marks)
4. (a) Discuss the different types of queues. (5 Marks)
- (b) Write the algorithms for insertion and deletion of elements in a circular queue. Trace the algorithm for a queue of size 4 for the following sequence of operations. (10 Marks)
  - i) Insert 3 elements
  - ii) Delete 2 elements
  - iii) insert 3 elements
  - iv) Delete 1 element.
- (c) Write the applications of stacks and queues. (5 Marks)
5. (a) Define a linked list. (4 Marks)
- (b) Write a C function to insert a node with value  $x$  to the right of node with value  $y$  in a singly linked list. (8 Marks)
- (c) Write an algorithm to search a node with value  $x$  and delete the node if it is found from a doubly linked list. (8 Marks)

Contd.... 2

- 6. (a) Explain the following terms with figures (10 Marks)**
- i) Binary tree
  - ii) Complete binary tree
  - iii) almost complete binary tree
  - iv) Binary search tree
  - v) Height of a tree.
- (b) Write an algorithm to search for an element  $x$  in a binary search tree. (6 Marks)
- (c) Write a recursive  $C$  function to perform post order tree traversal. (4 Marks)
- 7. (a) Write a C function to arrange  $n$  integers in ascending order using heap-sort technique. Trace the function for the input data set (4, 2, 7, 6, 8, 5). (12 Marks)**
- (b) Explain any one hashing function. (4 Marks)
- (c) Explain indexed sequential search. (4 Marks)
- 8. Write short notes : (5 × 4 = 20 Marks)**
- i) Scope of variables
  - ii) Structure and union
  - iii) Recursion
  - iv) Collision resolution

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NEW SCHEME

Second Semester B.E. Degree Examination, July 2007  
Data Structures Using 'C'

Time: 3 hrs.]

[Max. Marks:100

Note : Answer any FIVE full questions.

- 1 a. Explain union data type. How does it differ from a structure data type? (05 Marks)  
b. What is dynamic memory allocation? What are the functions that support dynamic allocation in 'C'? Give an example to each. (10 Marks)  
c. Explain call-by-value and call-by-reference methods. (05 Marks)
- 2 a. Define stack? List the primitive operations on stack and also write the 'C' implementation of these operations. (10 Marks)  
b. Write an algorithm for evaluating a postfix expression. Trace the algorithm on the following string indicating the contents of the stack  
623 + - 382 / + \* 2 \$ 3 + (10 Marks)
- 3 a. What is recursion? Write its properties. Compare the recursive program with iterative program. (08 Marks)  
b. Write recursive 'C' program for  
i) To generate N terms of Fibonacci sequence numbers.  
ii) Binary search. (12 Marks)
- 4 a. What are the advantages of circular queue over linear queue? Write a 'C' program to implement circular queue. (10 Marks)  
b. Define input restricted deque and output restricted deque with suitable diagrams. (06 Marks)  
c. What are priority queues? Explain briefly. (04 Marks)
- 5 a. What is doubly linked list? Write an algorithm for inserting a node to the left of a given node in a doubly linked list. (10 Marks)  
b. Define a binary tree. Explain the different tree traversals on a binary tree with example. (10 Marks)
- 6 a. Write a 'C' procedure to sort the records by using insertion sort technique. (10 Marks)  
b. What is a heap? Write a C program to sort an array of integers using heap sort method. Show the steps to sort the following elements :  
23 57 48 37 12 92 86 33 (10 Marks)
- 7 a. What is a binary search tree? Discuss how it is constructed. Mention the advantages of binary tree search algorithms. (08 Marks)  
b. Explain hashing with an example. How do you resolve hash clashes? (08 Marks)  
c. Write a note on efficiency of sequential searching. (04 Marks)
- 8 Write short notes on the following :  
a. Shell sort  
b. Interpolation search  
c. Queue as an ADT  
d. Threaded binary search



NEW SCHEME

MCA25

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Second Semester M.C.A Degree Examination, July/August 2005  
Master of Computer Applications

**Data Structures Using 'C'**

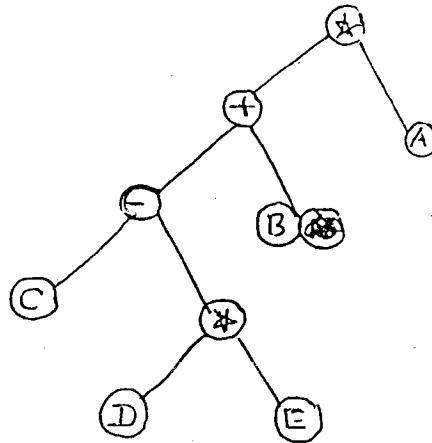
Time: 3 hrs.]

[Max.Marks : 100

**Note:** Answer any FIVE full questions.

- ✓ 1. (a) Explain the scope of each different storage classes of variables with an example. (10 Marks)
- (b) What is dynamic memory allocation ? Discuss the memory allocation and de allocation with the help of a suitable example. What are the advantages of dynamic memory allocation. (10 Marks)
- ✓ 2. (a) Define data structure. Explain various character string processing with examples. (8 Marks)
- (b) Write the difference between structure and union. (4 Marks)
- (c) Explain all operations that are performed on stack with C codes. (8 Marks)
- ✓ 3. (a) Convert the following infix expressions to postfix and prefix expressions.
- $(A + B) * (D - C)$
  - $A / B - (C + D) \wedge 3 * 3$
  - $X \wedge Y * Z - M + N + P / Q$
  - $B * C - D + E / F / (G + H)$
  - $A \wedge 3 + (B * C) / D \wedge 4$
- (10 Marks)
- (b) Write a c function to perform insert, delete and display operations on an ordinary queue. (10 Marks)
4. (a) Define priority queue ? Mention different operations of priority queue and explain them briefly. (10 Marks)
- (b) What is a linked list ? With the aid of algorithms discuss how a node can be inserted and deleted from a singly linked list. (10 Marks)
5. (a) Write advantages of doubly linked list over singly linked list. Write C function that will insert a given integer value into an ordered doubly linked list. (10 Marks)
- (b) Write recursive algorithm form
- Solving towers of Hanoi problem
  - Finding minimum of  $n$  numbers.
- (10 Marks)

6. (a) Define binary tree. Mention different types of binary trees and explain any two of them clearly. (8 Marks)
- (b) Define the following : (4 Marks)
- i) Ancestor
  - ii) Descendants of the node with respect to the TREE.
- (c) Write an output after traversing of a given tree by
- i) Inorder traversing method
  - ii) Preorder traversing method



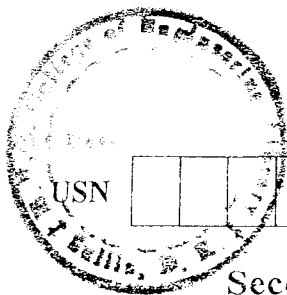
(8 Marks)

7. (a) What are different methods of searching ? Discuss their merits and demerits. (6 Marks)
- (b) Explain why the straight selection sort is more efficient than the bubble sort. (6 Marks)
- (c) Discuss the radix sort algorithm with an example. (8 Marks)
8. Write short notes on :
- a) Circular queue
  - ✓ b) Efficiency of recursion
  - c) Traversal of TREE
  - d) Interpolation search
- (4 × 5 = 20 Marks)

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Second Semester MCA Degree Examination, June / July 08  
**Data Structures Using C**

Time: 3 hrs.

Max. Marks:100

Note : Answer any FIVE full questions.

- 1  a. Define structure data type. How does it differ from union data type? (06 Marks)
- b. List out the advantages and disadvantages of arrays over linked list. (06 Marks)
- c. Describe the different storage classes. (08 Marks)
  
- 2  a. Write C program to evaluate a valid postfix expression. (08 Marks)
- b. Write an algorithm for converting an infix to postfix expression. (08 Marks)
- c. Convert the following infix expression to postfix and prefix expression. (04 Marks)
  - i)  $A + (B - C) * D \$(E * F)$
  - ii)  $(A + B * C) \$(A + B) * C$ .
  
- 3  a. Define recursion. Write recursive function for the following :
  - i) Binary search (10 Marks)
  - ii) GCD of two numbers. (02 Marks)
- b. What is the advantage of circular queue over ordinary queue? (08 Marks)
- c. Write C routines to perform the following operations on circular queue :
  - i) Insertion      ii) Deletion. (08 Marks)
  
- 4 a. Write C function to implement stack's push and pop operation using singly linked list. (10 Marks)
- b. List the advantages of doubly linked list over singly linked list. (03 Marks)
- c. Write C module to find the frequency of given element X in doubly linked list. (07 Marks)
  
- 5 a. Explain the following :
  - i) Descendant (08 Marks)
  - ii) Depth of a binary tree (08 Marks)
  - iii) Strictly binary tree (04 Marks)
  - iv) Complete binary tree.
- b. Explain the different methods of binary tree representation. (08 Marks)
- c. For the given data construct a BST. Write the outputs of three traversals on BST. 90, 50, 45, 60, 100, 120. (04 Marks)
  
- 6 a. Explain shell sort. Trace the shell sort for the following data. 25, 57, 48, 37, 12, 92, 86, 33. (08 Marks)
- b. Write C module to sort n integers using quick sort. Trace the quick sort for the above data. (12 Marks)
  
- 7 a. Write C module to search an element in a binary search tree. (06 Marks)
- b. What is hashing? Explain any two methods to resolve hash clashes. (10 Marks)
- c. Explain interpolation search. (04 Marks)
  
- 8 Write short notes on :
  - a. Priority queues
  - b. Threaded binary trees
  - c. Radix sort
  - d. Traversal methods for graphs. (20 Marks)



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**Second Semester MCA Degree Examination, June-July 2009**  
**Data Structures using C**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions.**

- 1
  - a. Write the differences between structure and union. (05 Marks)
  - b. Explain the implementation of one-dimensional arrays. (05 Marks)
  - c. Write a C program to concatenate 2 strings without using built in functions. (05 Marks)
  - d. Write a C program using arrays with pointers to find the largest and smallest elements. (05 Marks)
  
- 2
  - a. Define stack. Explain the implementation of push and pop operations. (08 Marks)
  - b. What are postfix expressions? Write a C program to evaluate a postfix expression. (08 Marks)
  - c. Convert the following infix expression into postfix format using stack method:  
 $A+(B*C-(D/E\wedge F)*G)*H$  (04 Marks)
  
- 3
  - a. Define recursion. Write a C program to find the factorial of a number. (06 Marks)
  - b. Write a C program using recursion to solve towers of Honai problem and trace the program for 3 disks. (07 Marks)
  - c. Write a C program to implement binary search using recursive method. (07 Marks)
  
- 4
  - a. What are queues? Explain insert, delete and display operations with respect to arrays. (08 Marks)
  - b. Define priority queues. Write a C program to implement priority queues with 3 sets. (08 Marks)
  - c. List out the advantages and disadvantages of arrays and linked lists. (04 Marks)
  
- 5
  - a. What are circular lists? Write a C program to implement circular lists insertion, deletion and display operations. (08 Marks)
  - b. Write a program using singly linked list to perform the following operations:
    - i) Insert at the front of a list.
    - ii) Delete at the front of a list.
    - iii) Display the list. (08 Marks)
  - c. List the applications of stacks and queues. (04 Marks)
  
- 6
  - a. Write a C program using doubly linked list to perform the following operations:
    - i) Create list by adding nodes at the front.
    - ii) Delete the node of a given data.
    - iii) Forward display. (10 Marks)
  - b. What are binary trees? Explain the memory representation of binary trees. (06 Marks)
  - c. Define graphs and mention their applications. (04 Marks)
  
- 7
  - a. Explain with C recursive functions for in-order, pre-order and post-order binary tree traversal methods. (08 Marks)
  - b. Explain the working of depth first search and breadth first search methods with examples. (06 Marks)
  - c. Construct the binary search tree for the input data set 40, 60, 50, 33, 55, 11 and write a C function to implement the same. (06 Marks)
  
- 8
  - a. Write a C program to implement selection sort method. Trace the function with the input data set: 77, 33, 44, 11, 88, 22, 66, 55. (08 Marks)
  - b. Explain the working of radix sort with the following input data set: 27, 59, 49, 39, 15, 95, 88, 37 (06 Marks)
  - c. Write short notes on:
    - i) Index sequential search.
    - ii) Interpolation search.
    - iii) Hash functions. (06 Marks)



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07MCA23

**Second Semester MCA Degree Examination, Dec.09-Jan.10**  
**Data Structures Using C**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions.**

- 1 a. Define a stack. Explain the operations that can be performed on a stack and give the 'C' implementations of the operations. (10 Marks)  
 b. Describe the different storage classes. (10 Marks)
- 2 a. Write a algorithm for converting an infix to postfix expression. (10 Marks)  
 b. Write a 'C' program to evaluate a valid postfix expression. (10 Marks)
- 3 a. Define recursion. Write the recursive function for the following:  
     i) Binary search (10 Marks)  
     ii) GCD of two numbers. (10 Marks)  
 b. Write a 'C' function to perform Insert, Delete and Display operations on an ordinary queue. (10 Marks)
- 4 a. Write a 'C' function to implement stack's push and pop operations using singly Linked list. (10 Marks)  
 b. Write a 'C' module to find the frequency of given element 'X' in a doubly linked list. (10 Marks)
- 5 a. How are linked list used to implement stacks and queues? Give the implementations of the same. (10 Marks)  
 b. What are the binary trees? Mention different types of binary trees and explain any two of them clearly. (10 Marks)
- 6 a. Explain shell sort. Trace the shell sort for the following data: 25, 57, 48, 37, 12, 92, 86, 33. (10 Marks)  
 b. Write 'C' module to sort 'n' integers using quick sort. Trace the quicksort for the above data. (10 Marks)
- 7 a. What is hashing? Explain any two methods to resolve hash clashes. (10 Marks)  
 b. Discuss Radix sort algorithm with an example. (10 Marks)
- 8 Write short notes on:  
     a. Binary search tree  
     b. Singly linked list  
     c. Stack  
     d. Circular queue. (20 Marks)

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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. 4/9=50, will be treated as malpractice.



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**Second Semester MCA Degree Examination, May/June 2010**

**Data Structures Using C**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions.**

**2. Algorithms can be in C-like language [pseudo code], but C functions should follow the C language syntax.**

- 1 a. Define a data structure. Explain the concept of ADT using ADT RATIONAL as an example. (10 Marks)
- b. Which are the different storage classes of variables? Explain the scope of each, with examples. (10 Marks)
- 2 a. Create a dynamic array of floats and sort it. Print the array before and after sorting. (08 Marks)
- b. Write a C function to evaluate a postfix expression and trace it for the following expression :  
AB + CD - E\$ \* F \*  
When A = 1, B =2, C = 2, D = 3, E = 2 and F = 2. (08 Marks)
- c. Given the starting address of an array how do you compute the address of a given element in one and two dimensional arrays? (04 Marks)
- 3 a. What is recursion? How to make a function recursive? Comment on the efficiency of recursion. (06 Marks)
- b. Write the recursive algorithms for :  
i) Finding the largest element in an array (08 Marks)  
ii) Multiplication of 2 natural numbers. (06 Marks)
- c. Suggest the algorithms for the primitive operations on queues. (06 Marks)
- 4 a. Compare and contrast the linked lists with arrays. (06 Marks)
- b. Explain the different solutions for the problem of priority queue deletion. (08 Marks)
- c. What are the non-integer lists and non-homogeneous lists? (06 Marks)
- 5 a. Write an algorithm to construct a linked list containing students marks [integer] in each node by successive insertion at the beginning of the linked list. (06 Marks)
- b. Consider the linked list constructed in question 5(a). Add grace marks of two, if the marks obtained by any student is < 40. Print the marks obtained by all the students before and after adding grace marks. (06 Marks)
- c. Write an algorithm which deletes every alternate node starting from the second node from a doubly linked linear list. [i.e. delete the nodes 2, 4, 6, - - - etc.] (08 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. Write an algorithm to construct a binary search tree and trace it for the following set of numbers :  
10, 8, 1, 15, 13, 12, 4, 16, 14, 9 (08 Marks)
- b. Define the following with examples :  
i) Strictly binary tree (04 Marks)  
ii) Tree edges. (04 Marks)
- c. Write the corresponding spanning trees for the following graph using DFS and BFS traversal techniques. (08 Marks)

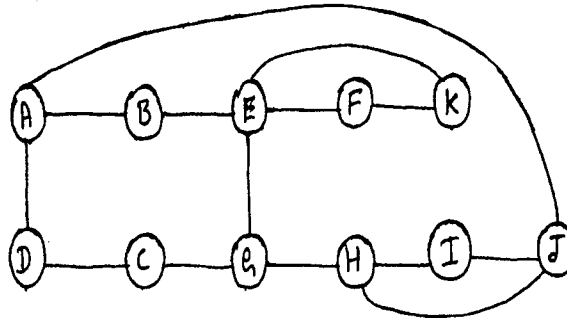


Fig. Q6(c)

- 7 a. Write a C function to sort a list of numbers using quick sort. (06 Marks)
- b. Write an algorithm to sort a set of values using sample insertion sort. Trace it for the following set of values :  
42, 23, 74, 11, 65, 58, 94, 36. (08 Marks)
- c. Explain the hashing. How do you resolve hash clashes? Explain with an example. (06 Marks)
- 8 Write short notes on, with an example :  
a. Radix sort  
b. Interpolation search  
c. Circular queues  
d. Threaded binary trees. (20 Marks)

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