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CS35

Third Semester B.E. Degree Examination, June / July 08
Data Structures with C

Time: 3 hrs. Max. Marks:100

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

1 a. Explain the meaning of the following:
i) int*P[10] ii) int(*P)[10] iii) intP(char*a[ ]). **(03 Marks)**

b. Write an appropriate declaration for each of the following situations:
i) Declare a function that accepts an argument which is an array of pointers to integer quantity and returns a character.
ii) Declare a pointer to a function that accepts an argument which is a pointer to integer array and returns a pointer to character.
iii) Declare a function that accepts two arguments an array and pointer to integer, and returns float. **(03 Marks)**

c. A C program contains following declaration:
Static int x[8] = {10, 20, 30, 40, 50, 60, 70, 80};
i) What is meaning of x?
ii) What is meaning of (x + 2)?
iii) What is meaning of *x ?
iv) What is meaning of (*x+2)?
v) What is value of *(x+2)? **(05 Marks)**

d. Write a C program that will encode or decode multiple line of text. Store the encoded text within a data file. The program should include following features:
i) Enter the text from keyboard, encode the text and store it in a data file
ii) Retrieve the encoded text and display it in its encoded form
iii) Display the size of file.
Encoding format is:
Original character A B C ---- Z a b ---- z
Encoded character D E F ---- C d e ---- c **(09 Marks)**

2 a. What are bit fields? To what type do bit fields belong? How are individual bits are accessed? Explain with an example. **(05 Marks)**

b. Define a structure student consisting of name, age and marks as its members. Allocate memory dynamically for N students. Read the information about the students from keyboard. Write a function that displays the student information having highest marks among N students. **(07 Marks)**

c. What is union data type? How is a union member accessed? How is a member of a union variable assigned an initial value? How it differs from that of structure variable? **(04 Marks)**

d. Write a C function min (array) that accepts the array of type integer and returns the address of minimum element of the array. **(04 Marks)**

3 a. Write an algorithm for converting a fully parenthesized infix expression to suffix expression. Use the algorithm to convert following expression to suffix expression:
A+(((B−C)*(D−E)+F)/G)*(H−J) **(07 Marks)**

b. Write a C program to check whether a given string is palindrome or not using stack operation. **(07 Marks)**

c. Write a C program using function PEEP( ) that checks whether given element is present in the stack or not. Display the result of the search in the main program. **(06 Marks)**

4 a. What is recursive function? Explain with an example what are its disadvantages. **(05 Marks)**
b. Write a recursive algorithm to search an element using binary search. Use this algorithm to find the element 3 in the array 1, 3, 7, 15, 21, 22, 36, 78, 95, 106. Show the tracing of the algorithm. **(08 Marks)**
c. Write a C function to implement Ackerman's function defined as below:
a(m, n) = n+1 if m = = 0
a(m, n) = a(m-1, 1) if m:= 0, n = = 0
a(m, n) = a(m-1, a(m, n-1)) if m: = 0, n: = 0
Calculate result for a(2, 2). **(07 Marks)**

5 a. What is priority queue? Write an algorithm to insert an element into a priority queue implemented using array. **(07 Marks)**
b. Write a C program to reverse the given single linked list. First pointer points to starting node of the list, and NULL value in the address of part of the node indicates end of list. **(07 Marks)**
c. Write an algorithm to insert a node into a circular queue implemented as a single linked list. **(06 Marks)**

6 a. Explain how a list can be implemented using array. What are its limitations? **(06 Marks)**
b. Write a C function to insert a node at a given position in a doubly linked list. **(07 Marks)**
c. Discuss the different ways of implementing binary tree structure. **(07 Marks)**

7 a. Write a C function of traverse a binary tree in preorder and post order. **(06 Marks)**
b. Discuss with respect to tree data structure i) Threaded binary tree ii) Expression. **(07 Marks)**
c. Explain with example the method of interpolation search. **(07 Marks)**

8 a. Write an algorithm to insert an element into binary search tree. **(08 Marks)**
b. Write an algorithm to sort a set of elements using address calculation sort. **(06 Marks)**
c. What is hashing? How hash clashes are resolved? Explain with an example. **(06 Marks)**

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CS35

Third Semester B.E. Degree Examination, Dec. 07 / Jan. 08
Data Structures with C

Time: 3 hrs. Max. Marks:100

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

1 a. If m and n have been declared as integers and p_1 and p_2 as pointers to integers, then state errors, if any in the following statement:
   i) $m = p_1/p_2$
   ii) $p_2 = n$
   iii) $*p_1 = \&n$
   iv) $p_1 = \&p_2$
   v) $m = p_1 - p_2$ **(05 Marks)**

b. Given the following declarations
   int x = 10, y = 10, res;
   int $*p_1 = \&x$, $*p_2 = \&y$;
   What is the value of res for following expressions:
   i) res = $(*p_1)$++;
   ii) res = --$(*p_2)$;
   iii) res = $*p_1 + (*p_2)$--;
   iv) res = ++$(*p_2) - *p_1$;
   v) res = ++x + y++; **(05 Marks)**

c. Define: i) Nested structures ii) Array of structure. Write a program by making use of the above concept to store student information and display the same. **(10 Marks)**

2 a. What do you mean by dynamic memory allocation? Explain any three functions that support dynamic allocation. **(05 Marks)**

b. What is preprocessor directive? Explain any two operations using preprocessor directive. **(05 Marks)**

c. Explain the following function with suitable example:
   i) fseek( )
   ii) ftell( )
   iii) rewind( )
   Write a program to count the number of characters, blanks, lines and tabs in a given input file. **(10 Marks)**

3 a. Design a method for keeping two stacks (grow towards each other) within a single linear array so that neither stack overflows until all of memory is used and an entire stack is never shifted to a different location within the array. Write C routines push1, push2, pop1, pop2, display1, display2 to manipulate the two stacks. **(10 Marks)**

b. Write a program to accept input as a characters string of operators and operands representing a postfix expression and to create the fully parenthesized infix form of the original postfix. For example AB+ would be transformed into (A+B) and AB+C- would be transformed into ((A+B)-C). **(10 Marks)**

4 a. Determine what the following recursive C function computes. Write an iterative function to accomplish the same purpose.

```
int func(int n)
{
    if(n= =0)
    return 0;
    return(n+func(n-1));
}
```

And also distinguish between the recursive function and iterative function. **(10 Marks)**

b. What is priority queue? Mention the different types of priority queues. Explain briefly the problems arise while inserting and deleting an item from the priority queue. Write a C program to implement priority queue. **(10 Marks)**

5 a. What are the advantages and disadvantages of representing a group of items as an array versus a linear linked list? **(05 Marks)**

b. Implement the routines insert, delete and display using a dynamic storage implementation of a linked queue. **(10 Marks)**

c. Write a C function to concatenate two lists. **(05 Marks)**

6 a. Define the following and give one example for each:

i) Binary tree
ii) Strictly binary tree
iii) Complete binary tree **(06 Marks)**

b. Write recursive functions to determine:

vi) The number of nodes in a binary tree
vii) The height of a binary tree. **(08 Marks)**

c. Write a C routine to evaluate postfix expression using an expression tree. **(06 Marks)**

7 a. Explain how an index sequential search is used to search for an element. Write down the advantages and disadvantages of index sequential search. **(10 Marks)**

b. Explain address calculation sort:
25, 57, 48, 37, 12, 92, 86, 33
Show the steps to sort the above elements. **(10 Marks)**

8 Write short notes:

a. Hashing
b. Doubly linked list
c. Tree traversal
d. Circular queue. **(20 Marks)**

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06CS35

Third Semester B.E. Degree Examination, Dec. 07 / Jan. 08
Data Structures with C

Time: 3 hrs. Max. Marks:100

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

1 a. Given the following declarations:
int x ; double d; int *p; double *q;
Which of the following expressions are not allowed?
i) p = &x; ii) p = &d; iii) q = &x; iv) q = &d v) p = x; **(05 Marks)**

b. Show what would be printed from the following block:

```
/* local definitions */
int x [2] [3] = {
                 { 4, 5, 2},
                 { 7, 6, 9}
                };
   /* statements*/
   fun (x);
   fun (x+1);
   return 0;
}
void fun (int (*p)[3])
{
  print f ("1n %d %d %d", (*p)[0], (*p)[1], *p[2]);
  return;
}
```

(06 Marks)

c. Briefly explain memory allocation functions. **(09 Marks)**

2 a. Implement i) Copying one string to another ii) Reversing the given string. Without using string library functions in 'C'. **(12 Marks)**

b. Write a C program to represent a complex number using structure and add two complex numbers. **(08 Marks)**

3 a. Define stack and operations over stack. Implement reversing a string using stack (array implementation) in C. **(12 Marks)**

b. What is recursion? Explain efficiency of recursion. Write a 'C' recursive program to solve tower of Hanoi problem. **(08 Marks)**

4 a. Write a C program to implement multiple stacks using single array. **(12 Marks)**

b. What is a linear queue? What are the applications of linear queue? Implement insert and delete operations. **(08 Marks)**

5 a. Given an ordered linked list whose first node is denoted by 'start' and node is represented by 'key' as information and 'link' as link field. Write a C program to implement deleting number of nodes (consecutive) whose 'key' values are greater than or equal to 'K_{min}' and less than 'K_{max}'. **(12 Marks)**

b. Write a C program to implement insertion to the immediate left of the Kth node in the list. **(08 Marks)**

6 a. Write a C program to implement doubly linked list with following operations:
i) Create ii) Insert. **(10 Marks)**

b. Implement concatenation of two circular singly linked lists List 1 and List 2. Use header nodes to implement the list. **(10 Marks)**

7 a. Implement Binary tree traversals in C: i) Inorder ii) Preorder iii) Postorder. **(10 Marks)**

b. What are the applications of binary tree? Implement binary search tree and check for duplicate data. **(10 Marks)**

8 Write short notes on:
a. Threaded binary tree b. Applications of stacks c. Array implementation of binary trees.
d. Structures and unions. **(20 Marks)**

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06CS35

Third Semester B.E. Degree Examination, June/July 08
Data Structure with C

Time: 3 hrs. Max. Marks:100

Note : ***Answer any FIVE full questions selecting at least TWO from each part.***

Part – A

1 a. What is a pointer variable? Can we have multiple pointers to a variable? Explain Lvalue and Rvalue expressions. **(06 Marks)**

b. Give atleast two differences between
   i) Static memory allocation and Dynamic memory allocation
   ii) malloc( ) and calloc( ) **(04 Marks)**

c. i) Write a C program using pass by reference method to swap two characters.
   ii) Give any two advantages and disadvantages of using pointers. **(10 Marks)**

2 a. How is a string stored in memory? Is there any difference between string and character array? Write a C program to copy one string to another, using pointers and without using library functions. **(06 Marks)**

b. How does a structure differ from an union? Mention any two uses of structures. What is bit field? Why are bit fields used with structures? **(07 Marks)**

c. What is a file pointer? Explain with syntax fopen( ), fread( ) and fwrite( ) functions. **(07 Marks)**

3 a. How do you define data structure? How is stack a data structure? Give a C program to construct a stack of integers and to perform all necessary operations on it. **(10 Marks)**

b. Write an algorithm to convert a valid infix expression to a postfix expression. Also evaluate the following suffix expression for the values A = 1, B = 2, C = 3 AB + C – BA + C$– **(10 Marks)**

4 a. Define recursion. Give atleast three differences between iteration and recursion. **(04 Marks)**

b. Write a C program using recursion to find GCD of two numbers. **(06 Marks)**

c. What is the advantage of circular queue over ordinary queue? Mention any two applications of queues. Write an algorithm CQINSERT for static implementation of a circular queue. **(10 Marks)**

Part – B

5 a. List out any two applications of linked list and any two advantages of doubly linked list over singly linked list. **(04 Marks)**

b. Write a C program to simulate an ordinary queue using singly linked list. **(10 Marks)**

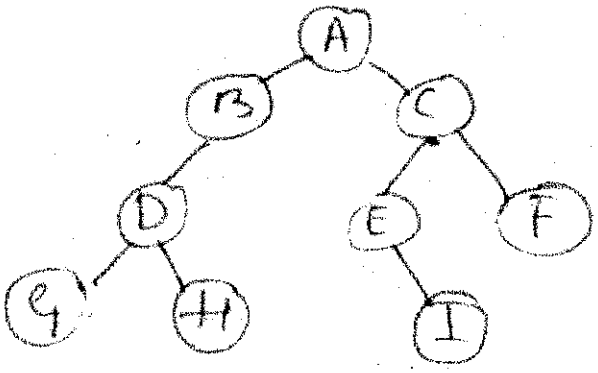
c. Give an algorithm to insert a node at the specified position for a given singly linked list. **(06 Marks)**

6 a. Write a C program to perform following operations on a doubly linked list.
   i) To create the list by adding each node at the front.
   ii) To display all the elements in reverse order. **(10 Marks)**

b. Write a C program to create a linked list and interchange the elements to the list at position m and n and display contents of the list before and after interchanging the elements. **(10 Marks)**

7 a. Define the following :
   i) Binary tree
   ii) Complete binary tree
   iii) Almost complete binary tree
   iv) Binary search tree
   v) Depth of a tree **(10 Marks**

b. Given the following graph, write inorder, preorder and postorder traversals. **(06 Marks**



c. In brief, describe any four applications of trees. **(04 Marks**

8 a. Construct a binary tree for $((6+(3-2)*5)\wedge 2+3)$ **(08 Marks**

b. Construct a binary tree from the traversal order given below :

Preorder :	A	B	D	E	F	C	G	H	L	J	K
Inorder :	D	B	F	E	A	G	C	L	J	H	K

(08 Marks

c. What is threaded binary tree? Explain right in and left in threaded binary trees. **(04 Marks**

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NEW SCHEME

Third Semester B.E. Degree Examination, July 2007
CS / IS
Data Structures with C

Time: 3 hrs.] [Max. Marks:100

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

1 a. What is a structure in C? How is it different from an array? Explain with example how a structure is declared and initialized. **(06 Marks)**
b. Explain with examples, the use of following operators referring to structures and pointers in C. i) dot ii) asterisk iii) arrow. **(06 Marks)**
c. Write a C program to read and store following information of 100 students: name, roll-number and marks. The program should print the names of all students whose name starts with 'S' and have scored more than 70 marks. Use structures. **(08 Marks)**

2 a. What is dynamic memory allocation? What are its merits? Differentiate between malloc( ) and calloc( ) functions. **(06 Marks)**
b. Explain fseek( ) and ftell( ) functions with examples. **(06 Marks)**
c. Write a C program to copy the contents of one file into another. Use command line parameters to accept the filenames. **(08 Marks)**

a. Define stack. Explain the basic operations and applications of stack. **(06 Marks)**
b. Write an algorithm to convert an infix string (without parenthesis) into a postfix string. **(06 Marks)**
c. Write the algorithm to evaluate a valid postfix expression. Hence evaluate the postfix expression ABC + * D / where A = 1, B = 2, C = 3 and D = 4. **(08 Marks)**

4 a. What is recursive definition? Explain the recursive definition for the factorial of a number. **(06 Marks)**
b. Write a recursive function for multiplication of natural numbers. **(06 Marks)**
c. Implement ordinary queue using array. Check for under flow and overflow conditions. **(08 Marks)**

5 a. What is a linked list? Explain with diagrams how nodes can be added and deleted from the middle of the linked list. **(06 Marks)**
b. Write a C routine insert end (plist, X) to insert the element X at the end of the singly linked list pointed by plist. **(06 Marks)**
c. Give the dynamic implementation of queue as a linear list. **(08 Marks)**

6 a. Explain a doubly linked list. What are its advantages and disadvantages over a singly linked list? **(06 Marks)**
b. With respect to the binary tree of figure Q6(b), answer the following with reasons:

Contd....2

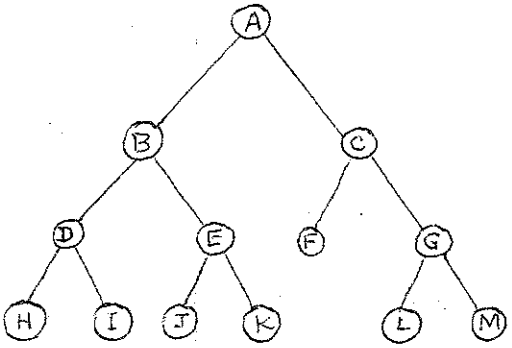

Fig. Q6(b)

i) Is it a strictly binary tree?
ii) Is it a complete binary tree?
iii) Is it an almost complete binary tree? **(06 Marks)**

c. Write a C routine setright (NODEPTR P, int X) which creates a node with information *x*, as the right son of a node pointed by *p*, in a right-in-threaded binary tree. **(08 Marks)**

7 a. What is a tree? How it is different from binary tree? Give the structure of a node of a binary tree. **(06 Marks)**

b. Explain how the following list of numbers can be sorted using Radix sort:
25, 57, 48, 37, 12, 92, 86, 33 **(06 Marks)**

c. Explain the indexed sequential search with example. **(08 Marks)**

8 Write short notes on:

a. Header nodes.
b. Implicit array representation of binary tree.
c. Shell sort.
d. Hashing. **(20 Marks)**

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CS35

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NEW SCHEME

Third Semester B.E. Degree Examination, Dec. 06 / Jan. 07
CS / IS
Data Structures with C

Time: 3 hrs.] [Max. Marks:100

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

1 a. What are bit fields? What is the advantage of using bit fields? Summarise the rules for defining and using bit field with suitable examples. **(07 Marks)**

b. What are command line arguments? Write a C program to accept the file name and text through command line arguments? Create a file with text and print the text on the screen. **(08 Marks)**

c. Write recursive function for Fibonacci series for the nth number. **(05 Marks)**

2 a. What is recursion? Give the properties of a recursive definition of an algorithm. What are its advantages? **(05 Marks)**

b. Show the detailed contents of the stack and trace of the algorithm to evaluate the given post fix expression, 123 + * 321 - + * **(05 Marks)**

c. What is a heap? Write a 'C' program to sort an array of integers using the heap sort method. Given 30, 61, 52, 42, 15, 90, 88, 37 are the elements of an array. Show the different stages of sorting. **(10 Marks)**

3 a. What is a stack? List the applications of stack. Write a 'C' function to inert an element on the top of stack. **(06 Marks)**

b. What is linked list? Write a 'C' function search (l, x) that accepts a pointer 'l' to a list of integers and an integer x and returns a pointer to a node containing x if it exists, and the null pointer otherwise. **(08 Marks)**

c. Mention different methods used for generating hash functions and explain them briefly. **(06 Marks)**

4 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. Define input restricted queue. Show with suitable 'C' program how we can implement a stack and a queue using the operations of input restricted queue. **(10 Marks)**

5 a. Construct a binary tree for the expression 12 + 3 – 21 + 3$ - and draw the diagram showing each step. **(07 Marks)**

b. Explain various types of tree traversal with examples. **(06 Marks)**

c. What do you understand by dynamic memory allocation? Explain any three functions that support dynamic memory allocation. **(07 Marks)**

6 a. In a singly linked list write the 'C' function to
i) To delete a node whose info field is specified.
ii) To delete a node at specified position. **(08 Marks)**

b. What are binary trees? Mention different types of binary trees and explain any two of them clearly. **(06 Marks)**

c. Explain any one collision resolving technique. **(06 Marks)**

7 a. Explain radix sort with example. Write the suitable algorithm for Radix sort. **(10 Marks)**

b. What is a circular queue? Write 'C' program to implement circular queue using arrays with operations of INSERT ( ), DELETE ( ) and DISPLAY ( ). **(10 Marks)**

8 Write short notes on:

a. File opening and closing functions in C
b. Sequential searching using an auxiliary table
c. Threaded binary tree
d. Simple insertion sort. **(20 Marks)**

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NEW SCHEME

CS35

Reg. No. [ ]

Third Semester B.E. Degree Examination, January/February 2006
Computer Science/Information Science and Engineering
Data Structures with C

Time: 3 hrs.) (Max.Marks : 100

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

1. (a) What is a structure? How is it different from an array? How are they defined and initialized? Explain with suitable example. **(6 Marks)**

   (b) What are bit fields? With a suitable example describe the declaration for reading and printing of bit fields. **(6 Marks)**

   (c) Explain the difference between buffered and unbuffered file I/O functions. Write a C-program using pointers to exchange the value of two variables. **(8 Marks)**

2. (a) Give a complete specification of data structure for STACK. **(8 Marks)**

   (b) Develop step-by-step algorithm or (C-program) to convert a given infix expression to postfix expression.

   Apply the above algorithm to convert the following infix expression into its equivalent postifx form.

   $$Q: A + B * C - (D/E \uparrow F) * G) * H$$

   (6+6 Marks)

3. (a) Define a recursion. List the important features of a recursive program. **(4 Marks)**

   (b) Compare iteration with that of recursion. Define with atleast three parameters; recursion relation for GCD of two numbers and formulate a recursive procedure in C for the same. **(10 Marks)**

   (c) What is circular queue? Write the implementation of circular queue using array. **(6 Marks)**

4. (a) What is the advantage of representing a group of integers using linked list? Write routines in C for performing the following :

   i) To find the sum of all the elements in a singly linked list

   ii) To find the average of a set of elements in a singly linked list. **(10 Marks)**

   (b) An ITEM of information is to be inserted in a sorted linked list. Develop an algorithm or C-routine for the given task. **(10 Marks)**

5. (a) With an example discuss how the data structure linked list is represented in memory. **(10 Marks)**

   (b) A circular -Q, the size of which is 5 has three elements 20, 40 and 60, where front =0 and rear = 2.

   Show with necessary diagrams, what is the value of front and rear after each of these operations :

   i) Insert item 50 ii) Insert item 10
   iii) Insert item 30 iv) Delete an item
   v) Delete an item **(6 Marks)**

   (c) Give a complete specification of data structure QUEUE. **(4 Marks)**

Contd.... 2

6. (a) With suitable example explain different types of tree traversals. **(6 Marks)**

(b) What is a threaded binary tree? Give the structure of a right in-threaded binary tree and its implementation in C for in-order traversal. **(9 Marks)**

(c) A binary tree T has 9-nodes, the in-order and pre-order traversal of T yields the following sequences of nodes :

Inorder :	E	A	C	K	F	H	D	B	G
Pre-order :	F	A	E	K	C	D	H	G	B

Draw the tree. **(5 Marks)**

7. (a) Illustrate with an example, how a selection sorting technique works? Give its implementation in the form of a C-program/algorithm, the sequence for given example. **(12 Marks)**

(b) Explain the principal criteria used in hashing functions. Discuss different hashing functions. **(8 Marks)**

8. Write short notes on :

(a) Interpolation search

(b) Radix sorting

(c) Command - line arguments

(d) Open addressing. **(5×4=20 Marks)**

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CS35

USN

NEW SCHEME

Third Semester B.E. Degree Examination, July 2006
CSE/ISE
Data Structures with C

Time: 3 hrs.] [Max. Marks:100

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

1 a. Explain the difference between array and structure with suitable examples. **(08 Marks)**

b. How do you declare arrays of structure? Explain with an example. **(04 Marks)**

c. Declare a variable 'code' of type union item consisting of an integer m, float x and char c. Explain what would be the output of the following statements:

```
code.c = 'A';
code.m = 385;
code.x = 14.7;
printf("%C %d", code.c, code.m);
```

(08 Marks)

2 a. How does an append mode in a file operation differ from the write mode? Explain with examples. **(05 Marks)**

b. How is a file referred to in a C program? Is it by the name of the file? Justify with an example. **(05 Marks)**

c. What is dynamic memory allocation? Explain with an example. **(04 Marks)**

d. Explain the difference between malloc and calloc functions used to allocate memory dynamically, with suitable examples. **(06 Marks)**

3 a. Define the push and pop operations on a stack, with suitable examples. **(04 Marks)**

b. Write an algorithm to find out whether an input string is of the form $x \subset y$, where x is a string consisting of letters 'A' and 'B' only, y is the reverse of x (i.e., if x = "AABAB", then y = "BABAA"). At each point, you may read only the next character of the string. **(10 Marks)**

c. Define the infix, postfix and prefix expressions with suitable examples. **(06 Marks)**

4 a. State clearly, the problem of 'Tower of Hanoi' and write a C program to solve this problem for 4 disks, using the technique of recursion. **(10 Marks)**

b. Explain the meanings of enqueueing and dequeueing with examples. **(04 Marks)**

c. When do you get error message 'Queue Overflow' and 'Queue Underflow'? Explain with examples. **(06 Marks)**

5 a. What is a list? What are its advantages and disadvantages compared with the array? **(06 Marks)**

b. Write C program with functions written separately for inserting an element in a list of integers. **(10 Marks)**

c. Explain the structures of Circular List and Doubly Linked Lists. **(04 Marks)**

Contd... 2

6 a. Explain clearly, with examples, the concepts of the following:
i) Binary Tree
ii) Strictly Binary Tree
iii) Complete Binary Tree
iv) Almost Complete Binary Tree. **(12 Marks**

b. Write a C program to construct a binary tree for the input
14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9, 14, 5
indicating a message for duplicate members. Draw the tree constructed by tl above program. **(08 Marks**

7 a. Explain the 3 traversal methods (in order, preorder and post order) of binai trees, with an example for each. **(09 Marks**

b. Write a C function that accepts a pointer to a binary tree and a pointer to node of the tree and returns the level of the node in the tree. **(06 Marks**

c. Draw the binary tree to represent the following expression:
3 + 4 * (6-7) / 5 + 3 **(05 Marks**

8 Write short notes on the following:
a. Internal and external sort.
b. Shell sort.
c. Insertion into a binary search tree.
d. Resolution of clashing in hashing. **(20 Marks**

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CSI33

USN

Third Semester B.E. Degree Examination, January/February 2005

Computer Science/ Information Science & Engineering

(Old Scheme)

Data Structures with C

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) Explain with suitable examples, the different operations that can be performed on the files. (10 Marks)

   (b) Write a note on the following : (10 Marks)

   i) Preprocessor statements

   ii) Dynamic memory allocation

2. (a) Define stack. Explain implementation of push and pop operations in C. (10 Marks)

   (b) With suitable example, explain infix, postifx and prefix expressions. Explain the role of stack in conversion of one form of the expression to another. (10 Marks)

3. (a) What is recursion? With example explain how recursion can be efficiently used in solving tower of Hanoi problem. (10 Marks)

   (b) Write recursive functions for the following :

   i) Binary search

   ii) Multiplication of natural numbers. (10 Marks)

4. (a) How circular queues are different from queues? Explain how queues can be implemented in C. (10 Marks)

   (b) Explain the implementation of lists in C using arrays. What are the limitations of array implementation? (10 Marks)

5. (a) Differentiate between tree and binary tree. With suitable example explain implicit array representation of binary trees. (8 Marks)

   (b) Explain with suitable examples, the different tree traversal techniques. (12 Marks)

6. (a) Explain the following with respect to sorting

   i) O notation ii) Efficiency. (10 Marks)

   (b) Write a C function to implement quick sort. (10 Marks)

Contd.... 2

7. (a) Explain the following : (10 Marks)

   i) Indexed sequential search

   ii) Interpolation search

   (b) Explain with suitable examples the process of inserting and deleting from a binary search tree. (10 Marks)

8. Write short notes on : (5×4=20 Marks)

   i) Macros in C

   ii) Radix sort

   iii) Hashing

   iv) Binary search

** * **

NEW SCHEME

CS35

USN

Third Semester B.E. Degree Examination, January/February 2005

Computer Science /Information Science and Engineering

Data structures with C

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) What is a structure? How is it different from an array? Explain the methods of initiating the structure members with an illustrative example. (10 Marks)

   (b) Write a C program to read the following information for n students in a class : Student name, regno, marks scored in three subjects. Pass the structure through the function to update percentage by 10%. (6 Marks)

   (c) Distinguish between the following :

   i) $(*m)[5]$ *and* $*m[5]$

   ii) $int\ (*ptr)\ (\ )$ *and* $int * ptr\ (\ )$

   (4 Marks)

2. (a) Develop a C program to write data of employees into a file. Each employee is a structure with the following members :

   Char name [10] float salary, int id, char designation [10]

   Further read the data from the file and display it on the console. (8 Marks)

   (b) What are command line arguments? Illustrate with a simple program. (6 Marks)

   (c) Develop a program to determine the sum of positive and negative elements of an array using dynamic memory allocation. (6 Marks)

3. (a) What is stack? Indicate how stack is represented in C. (5 Marks)

   (b) Write an algorithm for converting fix expression for post fix expression. Further, trace the above algorithm clearly indicating the contents of the stack for the following expression :

   $((A - (B + C)) * D)\$(E + F)$

   (15 Marks)

4. (a) What is recursion? Comment on the efficiency of recursive routines. (4 Marks)

   (b) Write a recursive C function to find the sum of all the elements in an array with N integer values. (6 Marks)

   (c) What is circular queue? Write the implementation of circular queue using array. Also develop the routines to perform following operation on the circular queue.

   i) Insertion ii) delection iii) Display. (10 Marks)

5. (a) Write algorithm to implement the following on a singly linked list :

   i) To find the average of a set of values

   ii) To replace all the occurrences at a given value by other value from the list. (10 Marks)

   (b) With an illustrative example, show how a queue can be structured as a circular list. (10 Marks)

Contd.... 2

6. (a) Enlist the advantages and disadvantages of doubly linked list over singly linked list. (4 Marks)

   (b) Write a program to insert a given value into an ordered doubly linked list into its proper position. (6 Marks)

   (c) Briefly explain the different operations performed on a binary tree. Also indicate the various schemes of representing a binary tree. (10 Marks)

7. (a) Construct the binary tree given the following inversals :

Pre - order	A	B	D	G	C	E	H	L	F
In - order	D	G	B	A	H	E	L	C	F

(8 Marks)

   (b) What do you mean by a threaded binary tree? Discuss the impact of such a representation on the tree traversal procedure. (8 Marks)

   (c) Comment on the number of comparisons in binary tree sort algorithm. (4 Marks)

8. (a) Explain the working of radix sort on a suitable data set and comment on its efficiency. (10 Marks)

   (b) What is hashing? Explain various methods for resolving hash collisions. (10 Marks)

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NEW SCHEME

CS35

USN

Third Semester B.E. Degree Examination, July/August 2005
Computer Science /Information Science and Engineering
Data structures with C

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) What are bit fields? Why are bit fields used with structures? Explain with an example. (6 Marks)

   (b) What are the disadvantages of not freeing the memory during dynamic allocation. (4 Marks)

   (c) Write a C-program to simulate rudimentary calculator by using pointers to functions. (10 Marks)

2. (a) Discuss the various operations that could be used for string manipulations. (8 Marks)

   (b) Write a C-program to print the reverse of a given 5 digit integer number
   i) Without using arrays ii) With using arrays. (12 Marks)

3. (a) Discuss the various exceptional conditions that should be handled while using stacks. (8 Marks)

   (b) Convert the following postfill expressions to its corresponding infill and prefill expressions : (12 Marks)
   i) ABCDE/* - F/G++
   ii) 234^ ^93 / + 43 * 2 + 5–
   iii) *abcdg*| * ++

4. (a) Write a C-program to display the nth hormonic number using recursion. Also display the number of calls made to the recursive functions. (7 Marks)

   (b) What is the output of this program if $S =$ "$VTUBelgaum$"

```
#include< studio.h>
do-something (S)
Chav  * S;
{
  if (*S! = NULL)
 {
  do-something (++S);
  putchar (*(--S));
 }
}
main ( )
{
  Chav S [80]
  printf ("Enter some thing in");
  get (s) ;
  do-something (S) ;
}
```

(6 Marks)

Contd.... 2

(c) Write a C-program to calculate the factorial of N using recursion handling all the exceptions. (7 Marks)

5. (a) What do you mean by a queue? Discuss queues with respect to its sequential representation. (6 Marks)

(b) Write a C-program to implement circular queues. (8 Marks)

(c) What do you mean by a priority in a queue? Explain the array implementation of the priority. (6 Marks)

6. (a) Write a C-program to add 2 polynomial containing 2 viriables using singly linked lists. (10 Marks)

(b) Write a C-program to check whether a given string is a paliydrome using doubly linked list. (10 Marks)

7. (a) Explain the following :

i) Binary tree

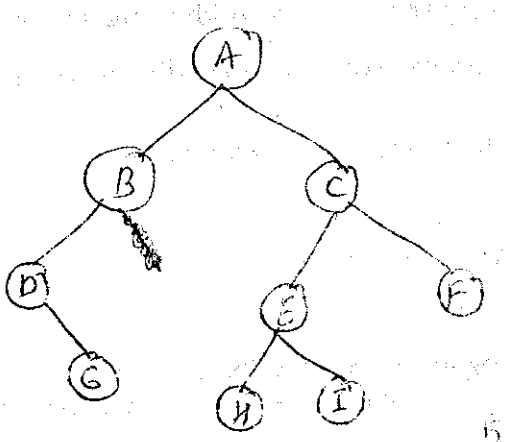
ii) Descendant -left and right in a binary tree

iii) Depth of a binary tree

iv) Compute binary tree

v) Level of a node. (2×5=10 Marks)

(b) Write the results after traversing the tree in in-order, pre-order and post order [Fig.7(b)]. (6 Marks)



(c) Write a note on any ONE of the following :

i) Address calculation sort ii) Radix sort. (4 Marks)

8. (a) List the various searching techniques. Explain in detail the interpolation search technique. (10 Marks)

(b) Write short notes on any TWO of the following :

i) Hashing

ii) Circular lists

iii) Tree searching. (5×2=10 Marks)

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NEW SCHEME

CS35

USN

Third Semester B.E. Degree Examination, January/February 2004

Computer Science /Information Science and Engineering

Data structures with C

Time: 3 hrs.]

[Max.Marks : 100

Note: *1. Answer any FIVE full questions.*
2. All questions carry EQUAL marks.

1. (a) What is a structure? How does a structure differ from an array? How are structure members assigned values and are accessed? Explain. Hence or otherwise develop a C function to represent a complex number using structure and to add two complex numbers. (8 Marks)

   (b) Write a C program to accept a string as a command line parameter and to print its length. (6 Marks)

   (c) Explain any two C functions of used for file handling. (6 Marks)

2. (a) Define a stack. List the operations on stack and give C implementation of these operations. (10 Marks)

   (b) Write an algorithm for evaluating a valid post fix expression. Trace the same on $AB + C - BA + C\$-$ for given value $A = 1, B = 2$, and $C = 3$. (10 Marks)

3. (a) What is recursion? Write a recursive function for computing n^{th} term of a Fibbonacci sequence. Hence or otherwise give the trace of stack contents for n=4. (10 Marks)

   (b) What is a circular queue? Give the static implementation of the same and write the CQINSERT routine. (10 Marks)

4. (a) What is a linked list? Compare static and dynamic implementation of linked lists in C. (10 Marks)

   (b) How can an ordinary queue is represented using a singly linked list? Give algorithms for inserting as well as deleting elements into a single linked list. (10 Marks)

5. (a) What are different methods to represent a binary tree and compare them? (10 Marks)

   (b) Given a binary tree implement the following :
   i) to compute its maximum depth
   ii) to print the nodes in ascending order assuming that the tree is a BST. (10 Marks)

Contd.... 2

6. (a) Give an algorithm for constructing a binary search tree. While constructing the tree take care that duplicate values are not added. Trace the algorithm on 8, 13, 10, 12, 6, 9, 5, 2. (10 Marks)

   (b) Write an algorithms for implementing the following :

      i) To concatenate two circularity linked lists

      ii) Delete the first occurrence of value X from a doubley linked list. (10 Marks)

7. (a) Explain the shell sort procedure by using a suitable data set. (10 Marks)

   (b) What is Hashing? Explain any two techniques for resolving hash collisions. (10 Marks)

8. Write notes on: (4×5=20 Marks)

   i) Expression tree

   ii) Priority queues

   iii) Simple insertion sort

   iv) Dynamic memory allocation in C.

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CSI33

USN

Third Semester B.E. Degree Examination, January/February 2004

Computer Science/ Information Science & Engineering

Data Structures with C

(Old Scheme)

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) Differentiate between following C functions
   i) getc & putc
   ii) getw & putw
   iii) fprintf & fscanf

   (b) What is dynamic memory allocation ? What is the principal difference between the function malloc & Calloc? Explain. (12 Marks)

2. (a) What is a stack ? Explain how it can be represented in C. Write a C function to perform pop operation on stack. (8 Marks)

   (b) Write an algorithm to convert a fully parenthesized infix expression into postfix expression. Trace this algorithm for the following expression. (8 Marks)

$$(A+B)*(C-D)\$E*F$$

3. (a) Explain the tower of Hanoi problem. State the recursive solution for tower of Honoi problem. How it can be implemented in C? (12 Marks)

   (b) How can queues be implemented in C ? Explain with example why q . rear < q. front is no longer valid as a test for empty queue. (12 Marks)

4. (a) Explain how stacks and queues can be implemented using lists. Write the algorithms to perform the primitive operations of stack and queues for the above implementation. (8 Marks)

   (b) What is doubly linked list ? Explain the two ways of implementation of doubly linked list. (14 Marks)

5. (a) What is a binary tree ? When do we call a binary tree as complete binary tree ? Explain with examples. (6 Marks)

   (b) Write a recursive routine in C for implementing tree traversal techniques. (6 Marks)

   (c) How can an ordered tree be represented in C ? Explain how ordered tree may be used to represent a given expression. (6 Marks)

6. (a) With example, explain quick sort procedure. (8 Marks)

   (b) Write a C routine to implement shell sort. Illustrate the shell sort for the following sample file.

   25 57 48 37 12 92 86 33

   (10 Marks)

Contd.... 2

7. (a) How efficient is the sequential search ? Explain the different methods used to get maximum search effeciency. (8 Marks)

   (b) Write an algorithm to insert a record into binary search tree. Explain. (6 Marks)

   (c) With suitable example, explain the process of deletion of node with key from a binary search tree, considering all three cases. (6 Marks)

8. Write a short note on :

   a) Bitwise operators and operations

   b) Efficiency of Recursion

   c) Priority Queues

   d) Threaded Binary Tree (5×4=20 Marks)

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NEW SCHEME

CS35

USN

Third Semester B.E. Degree Examination, July/August 2004
Computer Science /Information Science and Engineering
Data structures with C

Time: 3 hrs.] [Max.Marks : 100

Note: *1. Answer any FIVE full questions.*
2. All questions carry equal marks.

1. (a) What is union? How is it different from structure? With a suitable example show how union is declared and used in C. (6 Marks)

   (b) What do you understand by dynamic memory allocation? Explain any three functions that support dynamic allocation. (6 Marks)

   (c) What are command line arguments? Write a C program to copy contents of a file to another file. Accept file names as command line arguments. (8 Marks)

2. (a) List applications of stacks. Using stack write an algorithm to determine if a given string is palindrome and print suitable message as output. (10 Marks)

   (b) Write an algorithm for converting infix expression to post-fix expression. Trace the algorithm indicating content of stack for expression $(a-b)/(c*d)+e$ (10 Marks)

3. (a) What is recursion? Explain with an example. (8 Marks)

   (b) Write recursive function for :

      i) Fibonacci series for n^{th} number. (6 Marks)

      ii) Printing number in reverse order. (6 Marks)

4. (a) What are different types of linked list? Write a C function to count number of elements present in single linked list. (10 Marks)

   (b) 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)

5. (a) Explain various types of tree traversal with simple example. (6 Marks)

   (b) Write C functions for following tree traversals :

      i) Inorder ii) Preorder iii) Post order. (6 Marks)

   (c) Construct a binary tree for the expression $A+(B-C)*(E+F)/G$ and draw the diagram showing each step. (8 Marks)

6. (a) Explain binary tree sort with suitable example. Comment on its efficiency. (10 Marks)

   (b) What is interpolation search? Explain with an example. (10 Marks)

Contd.... 2

7. (a) What is hashing? Explain any two hashing methods for resolving hash collision. (10 Marks)

   (b) Write an algorithm for deleting a node from binary search tree considering all possibilities. (10 Marks)

8. Write short notes : (4×5=20 Marks)

   a) Threaded binary tree

   b) Circular queue

   c) Dynamic stack representation

   d) Fill operation functions.

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CSI33

USN

Third Semester B.E. Degree Examination, July/August 2004

Computer Science/ Information Science & Engineering

(Old Scheme)

Data Structures with C

Time: 3 hrs.] [Max.Marks : 100

1. (a) Write a C program to copy the contents of a file to another file. the source file and the target file have to be read from the keyboard. Use command line arguments. (10 Marks)

   (b) What is dynamic memory allocation? Explain the functions in C language used for dynamic memory management. (10 Marks)

2. (a) How do you represent stack in C? Write the C implementation of basic functions of stack. (10 Marks)

   (b) Write the algorithm to convert a given valid infix expression to its postfix equivalent. Demonstrate the same with respect to the following example :
   $A*(B+C)*D$ (10 Marks)

3. (a) How do you represent circular queue in C? Write the C implementations of the basic queue management routines (circular queue) (10 Marks)

   (b) Write a recursive function to compute n^{th} Fibonacci number. Discuss on the efficiency of recursion. (10 Marks)

4. (a) Write functions in C to perform following operations on singly linked lists :
   i) search for the key in a given list and return pointer to the node if found, otherwise NULL.
   ii) Concatenate the given two lists $l1$ and $l2$. (10 Marks)

   (b) How do you represent doubly linked lists in C? Write functions to
   i) insert a node into a doubly linked list
   ii) delete a node from a doubly linked list. (10 Marks)

5. (a) What is a binary tree? How do you represent binary trees in C? Write algorithms to perform the traversals of binary tree. (10 Marks)

   (b) What is a threaded binary tree? How do you insert a node into a threaded binary tree. Write the algorithm for the same. (10 Marks)

6. (a) Write the algorithm to perform quicksort on a given set of integers. Demonstrate the working on the set : $\{26, 33, 35, 29, 12, 22\}$. (10 Marks)

   (b) What is a heap? Write an algorithm to sort a given list of numbers using heapsort technique. (10 Marks)

Contd.... 2

7. (a) Write the function to perform binary search on a given set of a integers. Explain the performance of the same with respect to relevant data. (10 Marks)

(b) What is hashing? Explain with an example. (10 Marks)

8. Write short notes on : (4 × 5=20 Marks)

i) Preprocessor statements

ii) Shell sort technique

iii) Radix sort

iv) Interpolation search

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CSI33

Reg. No. | | | | | | | | | | |

Third Semester B.E. Degree Examination, January/February 2003

Computer Science & Engineering

Data Structures with 'C'

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) What are preprocessor directives? Explain with examples complier control preprocessor directive. (8 Marks)

   (b) What are command line parameters? Write a C program to copy a given line of text into a file. Accept filename and text as command line parameters. (7 Marks)

   (c) What are bit fields? With a suitable example explain declaration for reading and printing of bit fields. (5 Marks)

2. (a) Define stack. Using stacks write an algorithm to determine if an input character string is of the form $x \subset y$. Where x is a string consisting of letters 'A' and 'B' and Y is a string which is the reverse of x. Ex If X = "ABABBA" y will be "ABBABA". At each point you may read only the next character of the string. (10 Marks)

   (b) Write an algorithm for converting a valid parenthesized infix expression to postfix form. Trace your algorithm on the following string. $((A+B)*C-(D-E))\$(F+G)$. (10 Marks)

3. (a) With an example program illustrate the properties of a recursive program. (6 Marks)

   (b) Why does a recursive program employ an internal stack. (4 Marks)

   (c) Write recursive 'C' program for

      i) Solving towers of Hanoi problem

      ii) Finding maximum of n numbers. (10 Marks)

4. (a) With suitable example explain the advantage of circular queues over linear queues. for static implementation of circular queues write functions in 'C' for i) Inserting an element ii) Displaying queue contents. Assume that integers are stored in the queue. (10 Marks)

   (b) What is the advantage of representing a group of integers using linked list? Write routines in C for performing the following

      i) To find the sum of all the elements in a singly linked list.

      ii) To append a new element to the end of the linked list. (10 Marks)

5. (a) What is the advantage of representing an ascending order priority queue as an ordered linked list? For such an implementation write the algorithms pqinsert and pqmindelete. (10 Marks)

   (b) Write an algorithm to delete a node which has nonempty left substree from a BST. (5 Marks)

Contd.... 2

(c) What are the advantages of doubly linked list over singly linked list? Illustrate with examples. **(5 Marks)**

6. (a) What is a binary tree? Explain the implicit sequential representation of a binary tree listing its merits & demerits. **(6 Marks)**

(b) What is a threaded binary tree? Write an algorithm for inorder traversal of right in threaded tree. **(8 Marks)**

(c) For the following tree traversal construct the tree

Inorder	B	C	A	E	G	D	H	F	I	J
Preorder	A	B	C	D	E	G	F	H	I	J

(6 Marks)

7. (a) Show the steps for sorting the following data using address calculation sort.

42 37 11 98 36 72 65 10 88 78 **(5 Marks)**

(b) What is hashing? Name the methods for resolving hash collisions & explain any one. **(10 Marks)**

(c) Write a note on the efficiency of sequential search procedure. **(5 Marks)**

8. Write short notes on

i) Interpolation search

ii) Simple insertion sort

iii) Dynamic implementation of stacks

iv) Efficiency of recursion. **(4×5=20 Marks)**

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(Pages : 2) **CSI—33**

THIRD SEMESTER B.E. (COMPUTER SCIENCES/INFORMATION SCIENCE) DEGREE EXAMINATION, AUGUST/SEPTEMBER 2000

DATA STRUCTURES WITH C

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*

I. (a) Write the output of the following C program :

```
main ( )
{ int i = 32, j = 0 × 20 ;
  int k, l, m ;
  k = i/j ;
  l = i & j ;
  m = k ^ l ;
  printf ("in % d % d % d % d % d", i, j, k, l, m) ;
  }
```

(3 marks)

(b) With the help of a suitable example explain command line arguments. (5 marks)

(c) Explain call-by-value and call-by-reference. Give *two* examples. Define formal and actual parameters.

(12 marks)

II. (a) Define Recursion. Write a recursive program to find GCD of two numbers.

(8 marks)

(b) Write a C program to perform the following operation on stack (i) Push ; (ii) Pop ; and (iii) Display.

(12 marks)

III. (a) Define Priority queues and explain. (4 marks)

(b) A circular queue has a size of 5 and has 3 elements 10, 40 and 20, where F = 2 and R =4. After inserting 50 and 60, what is the value of F and R. Trying to insert 30 at this stage what will happen ? Delete 2 elements from the queue and insert 100. Show the sequence of steps with necessary diagrams with the value of F and R.

(8 marks)

(c) Write a C program to perform the following operations on a queue :

(i) Insert. (ii) Delete.

(iii) Display.

(8 marks)

IV. (a) Explain merging of two lists which have been represented as (i) Array and (ii) Linked list.

(12 marks)

Turn over

(b) Write a C function to insert and delete a node from the front end in case of doubly linked list.

(8 marks)

V. (a) Given the following traversals :

Inorder :	E	I	C	F	J	B	G	D	K	H	L	A
Preorder :	A	B	C	E	I	F	J	D	G	H	K	L

Draw the tree.

(6 marks)

(b) Explain with suitable example, the following traversals of a tree (i) Preorder ; and (ii) Inorder.

(4 marks)

(c) Write an algorithm to insert an element into a Binary search tree. (10 marks)

VI. (a) Explain one-way and two-way threading of binary trees. (8 marks)

(b) Write algorithms for deleting anode in a binary search tree for all the three cases.

(12 marks)

VII. (a) Write a function to search for an item using a binary search tree. (8 marks)

(b) Draw the heap for the elements shown below. Also write a C program to implement heap sort using an array :

50 25 30 75 100 45 80

(12 marks)

VIII. (a) Show the detailed concepts of the stack to evaluate the following positive expression :

632 – 5 * + 1 ^ 7 +

(4 marks)

(b) Obtain prefix and postifix expression :

(i) (A + B) * (C + D) $ (A + B)

(ii) A + B * C – D/E * H

(iii) (A + B ^ C ^ D) * (E + F/D)

(6 marks)

(c) Show the steps to sort the following elements in ascending order using address calculation :

19 13 05 27 01 26 31 16 02 09 11 21.

(10 marks)

CSI33

USN

Third Semester B.E. Degree Examination, July/August 2003

Computer Science / Information Science & Engineering

Data Structures with 'C'

Time: 3 hrs.] [Max.Marks : 100

Note: *1. Answer any FIVE full questions.*
2. Assume suitable data where required.

1. (a) What is a preprocessor directive? Explain any two operations that can be done using preprocessor directive. **(8 Marks)**

(b) What is bitwise operator? Give example for each operator. **(6 Marks)**

(c) What is dynamic memory allocation? Discuss the dynamic memory allocation with the help of a suitable example. What are the advantages of dynamic memory allocation? **(6 Marks)**

2. (a) What is a STACK? Explain operation performed on STACK. Discuss how the stack structure can be used for tower-of-Hanoi problem. **(12 Marks)**

(b) Write a C program to convert Infix expression to Postfix expression. **(8 Marks)**

3. (a) What is recursion? Discuss an example which can be represented both recursively and iteratively. **(8 Marks)**

(b) Write a program to implement circular queue and perform following operations.
i) Insertion ii) Deletion iii) DISPLAY. **(12 Marks)**

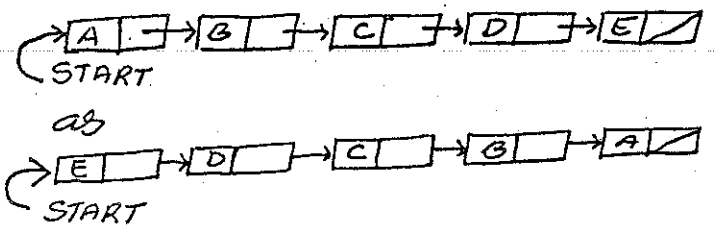
4. (a) What is a singly linked list? explain with an example how a singly liked list can be used for sorting a set of N numbers. **(8 Marks)**

(b) Write a C function to

i) to count number of nodes using singly linked list.

ii) to concatenate two singly linked list, and then to sort the resultant list. **(12 Marks)**

iii) to reverse direction of singly linked list (As shown below)



5. (a) Write a program to represent a polynomial of single variable using linked list and perform the following functions. (12 Marks)

   i) Evaluation of polynomial

   ii) Display the polynomial.

   (b) Write C functions to perform the following operations :

   i) create a circular single linked list

   ii) Display circular single linked list. (8 Marks)

6. (a) What is a TREE? Define the following :

   i) Ancestor ii) Descendants of node with respect to the TREE. (6 Marks)

   (b) Given two traversal of TREE, construct a single binary TREE. (6 Marks)

   INORDER : G D H B A E I C F

   PREORDER : A B D G H C E I F

   (c) Write a C function to create expression TREE using postfix expression, and discuss how a postfix expression can be transformed to its equivalent prefix expression. (8 Marks)

7. (a) Define the following ;

   i) Big Oh Notation (O)

   ii) Omega Notation (Ω)

   iii) Theta Notation (θ) (8 Marks)

   (b) Write a C program to sort a list of N elements of integer type using Quick sort. Also discuss best case average case and worst case complexities of quick sort mechanism for sorting N numbers. (12 Marks)

8. Write short notes on :

   i) Deque

   ii) Radix sort

   iii) Doubly linked list

   iv) Traversal of TREE. (4×5=20 Marks)

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