Reg. No.

Third Semester B.E. Degree Examination, July/August 2002

Computer Science & Engineering

Data Structures with C

Time: 3 hrs.]

[Max.Marks : 100

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

1. (a) With examples explain the various bitwise operators available in C. (7 Marks)

   (b) Mention the functions used for finding out the memory size of a data element and to dynamically allocate required memory. (6 Marks)

   (c) What is macro substitution? Mention different macro substitution methods and explain any one of them. (7 Marks)

2. (a) Given the following expressions give their post fix and prefix forms.

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

   ii) $X\$Y * Z - M + N + P/Q \mid (R + S)$ (8 Marks)

   (b) Give the algorithm to evaluate a given expression in the postfix form. Very briefly discuss the different steps used in the algorithm. (8 Marks)

   (c) Show the contents of the stock used while evaluating the postfix expression $AB + CD - *$ (4 Marks)

3. (a) What is recursion? Discuss the conditions to be satisfied for writing success-ful recursive procedures. How does iterative procedures differ from recusive procedures? (8 Marks)

   (b) Determine what the following C function does. Justify your answer.

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

   (c) Develop a recursive function to generate n terms of the Fibonacci sequence. Comment on the efficiency of the function written by you. (8 Marks)

4. (a) Clearly distinguish between linked lists and arrays. Mention their relative advantages and disadvantages. (6 Marks)

   (b) What is a priority queue? Mention the different types of priority queue's and explain them very briefly. (8 Marks)

   (c) Write an algorithm to insert an element after a given node in a singly linked list. (6 Marks)

5. (a) What are binary trees? Mention different types of binary trees and explain any two of them clearly. (8 Marks)

(b) What do you mean by tree traversing? Mention the different tree traversal methods and explain each one of them. (12 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 intergers using the Heap sort method. Given 30, 61, 52, 42, 15, 90, 88, 37 are the elements on the array, show the different stages of sorting. (10 Marks)

7. (a) What is a binary search tree? Discuss how it is constructed. Mention the advantages of binary tree search algorithms. (8 Marks)

(b) Write a note on efficiency of binary searching. (6 Marks)

(c) Mention any two methods used for generating hash functions and explain them very briefly. (6 Marks)

8. Write notes on:

(a) Collision resolution technique

(b) Sequential searching using an auxiliary table

(c) File opening and closing functions

(d) Enumerations. (20 Marks)

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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 pre-processor 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)

(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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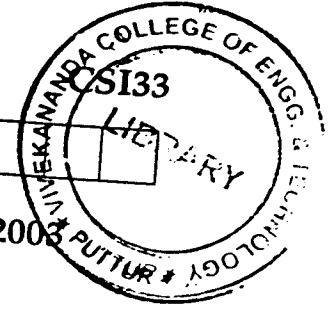
Third Semester B.E. Degree Examination, July/August 2003
### Computer Science / Information Science & Engineering
Data Structures with 'C'

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.
   iii) to reverse direction of singly linked list (As shown below) **(12 Marks)**

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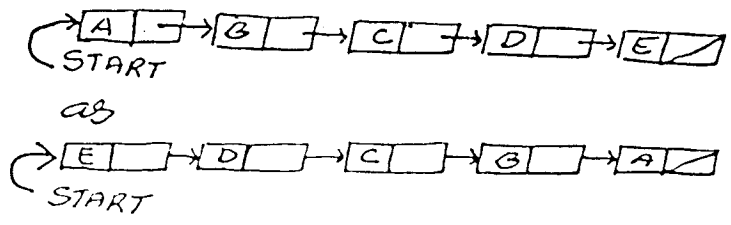
5. (a) Write a program to represent a polynomial of single variable using linked list and perform the following functions. (12 Marks)

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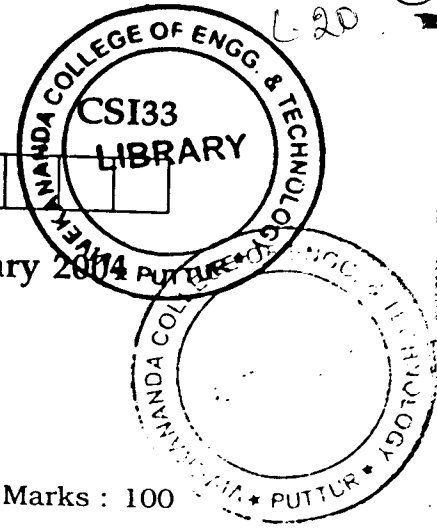
Third Semester B.E. Degree Examination, January/February 2004

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
   (12 Marks)

   (b) What is dynamic memory allocation ? What is the principal difference between the function malloc & Calloc? Explain. (8 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.

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

   (12 Marks)

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. (8 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. (14 Marks)

   (b) What is doubly linked list ? Explain the two ways of implementation of doubly linked list. (6 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. (8 Marks)

6. (a) With example, explain quick sort procedure. (10 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)

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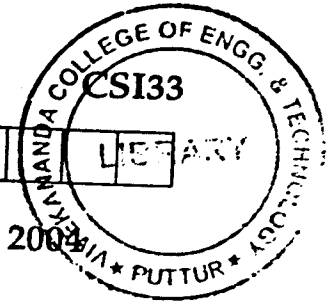
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Third Semester B.E. Degree Examination, July/August 2004

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)

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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NEW SCHEME

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CS35

Third Semester B.E. Degree Examination, January/February 2004
Computer Science /Information Science and Engineering
Data structures with C
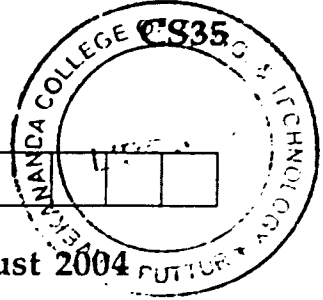
Time: 3 hrs.]

[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)

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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NEW SCHEME

USN

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

Computer Science /Information Science and Engineering

Data structures with C

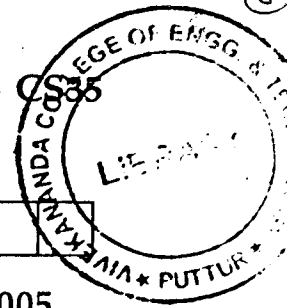Time: 3 hrs.]   [Max.Marks : 100

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. **(5 Marks)**

    (b) Write C functions for following tree traversals :

    i) Inorder   ii) Preorder   iii) Post order. **(5 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. **(12 Marks)**

    (b) What is interpolation search? Explain with an example. **(12 Marks)**

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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NEW SCHEME

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)**

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

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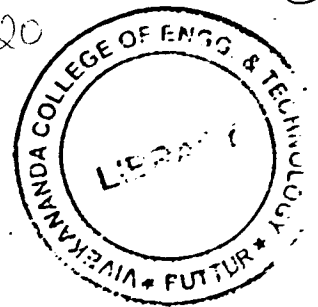
Third Semester B.E. Degree Examination, July/August 2005
Computer Science /Information Science and Engineering
# Data structures with C

[Hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

(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)**

(a) Discuss the various operations that could be used for string manipulations. **(6 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)**

( ) 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) $234^\wedge {}^\wedge 93 / + 43 + 2 \div 5$

    iii) $abcdg \mid + ++$

( ) 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 $S = "VTU Belgaum"$

```
#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)

(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)**

Fig 7 b
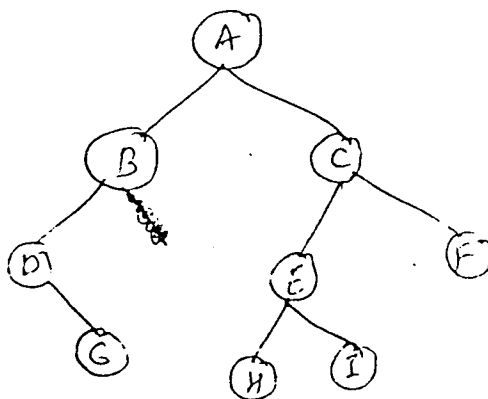
(c) Write a note on any ONE of the following :
   i) Address calculation sort   ii) Radix sort. **(4 Marks)**

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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CS35

NEW SCHEME

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)**

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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

(5 Marks)

Draw the tree.

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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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)**

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 the
         above program.   (08 Marks)

7   a.   Explain the 3 traversal methods (in order, preorder and post order) of binary
         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 a
         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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NEW SCHEME   *L· 20*

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   c. Threaded binary tree
   b. Sequential searching using an auxiliary table   d. Simple insertion sort. **(20 Marks)**

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