Data Structure Using C

1 (i) Describe the following terms
(a) Pointer (b) Structure
(c) Array (d) Function
(e) Pointer to Structure (f) Pointer to array
(g) Header linked list
(ii) Write the program for : (any two) 10
(a) Linear search
(b) Bubble sord
(c) Merge Sort.

2 (a) Write a menu-driven program to implement a stack with the following functions :
Push (), Pop (), Peep (), display ().

(a) Write a menu-driven program to implement a simple queue with the following functions :
insert (), update (), del(), display ()

(b) Write short notes on :
(i) Recursion (ii) Command line arguments (iii) Binary search (iv) Quick sort.

3 Answer the following questions :
(i) What is a file? Describe text file, binary file, sequential file and Random access files.
(ii) Compare insertion sort and selection sort.
(iii) Differentiate between call by value and call by reference for a function. Give examples for both.
(iv) Write a program to copy one data file to another. The file names are to be accepted from the user.

4 Attempt any two of the following questions
(i) Implement a circular queue that can perform insert and delete functions. What are the advantages of a circular queue over a simple queue.
(ii) What is a binary tree? What do you mean by tree traversal? Explain the traversal algorithms.
(iii) List the advantages of a simple linked list over an array. Write a program to implement a simple linked list with the following functions : search (), insert (), delete ().

5 Attempt the following questions :
(i) Implement a circular linked list with the following functions : insert (), update(), delete ().
(ii) Implement a doubly linked list with the following functions : insert(), search (), delete().
(iii) Discuss the storage structure of an array of structures and a structure of arrays.

1 Answer any four of the following questions :
(i) What is data structure? Highlight its importance in the field of programming.
(ii) What do you mean by memory allocation? Specify the types of memory allocation and explain each in detail.
(iii) What is binary tree? Explain with suitable program example how you will create a binary tree in 'C' language.
(iv) What is traversal? Write algorithm for in-order, pre-order and post-order traversal of binary tree.
(v) Write an algorithm that will split a linked list into two-linked list, so that successive nodes go to different lists (i.e.The first, third and all odd-numbered nodes to the first list and the second, fourth and all even-numbered nodes go to the second).

2 Attempt any four of the following :
(i) Write 'c' program to multiply two matrices.
(ii) Write algorithm/program to insert node in queue.
(iii) Write algorithm/program to pop element from stack in linked allocation.
(iv) Write algorithm/program to reverse a string using stack technique.
(v) Write algorithm/program to create ordered linked list.

3 (a) Answer any two of the following:
(i) Show pictorial representation of queue after each pop/push operations on queue
(1)push values 6,4,5,6
(2)pop two values
(3)push 5,9,6
(4)pop one value.

(ii)Create Binary trees for following expressions:
(1)((a+b)-c) * d – e + f (2)A * (-b) / (c+d) $ e ('$' shows exponent).

(iii)Given a linked list whose typical node consists of an INFO and LINK field, prepare 'C' program which willcount number of nodes in list.

3 (b)Write short notes on following :
(i)Linked dictionary
(ii)Application of binary tree
(iii)Graph.

4 Explain the following terms :
(i)Header node
(ii)Node
(iii)Binary tree
(iv)Root node
(v)Terminal node
(vi)Non-terminal node
(vii)In degree
(viii)Out degree
(ix)Complete binary tree
(x)Strictly binary tree
(xi)Mix graph
(xii)Directed edge.

5 Attempt any four of the following :
(i) Explain procedure to insert element into an array with an example.
(ii) What is stack? Give & Explain application areas of stack.
(iii) Explain with example how array of structure ('C' language)is stored in memory.
(iv) Explain circular queue. Explain position of empty circular queue with 6 rooms after each of following operation :

(a)insert 99
(b)Insert 88
(c)Insert 66
(d)Insert 55
(e)insert 44
(f)delete 99
(g)delete 88
(h)Insert33
(i)Insert 22
(j)Insert 11

(v)Explain doubly link list with example. How it differs from singly link list ?

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1 Attempt any four :

(i) Explain following logic gates with truth table :

(a) AND (b) OR

(c) NAND (d) NOR

(e) XOR

(ii) What is Boolean Algebra? Using truth table prove that (A+b)' = A'.B'

(iii) Simplify the following expressions and draw the circuit diagram of simplified expression.

(a) AB + A (CD + CD')) (BC' + A' D) (AB' + CD')

(iv) Explain full adder

(v) Discuss NAND gate as an universal gate.

2 Explain any four components :

(a) 3 to 8 line decoder

(b) 4 to 1 line multiplexer

(c) Octal to Binary Encoder

(d) Unidirectional Shift register

(e) Asynchronous 4-bit Binary Counter.

3 Attempt any four :

(a) Explain floating point representation of a number.

(b) What do you mean by parity bit? Describe how data is transferred using parity bit.

(c) Explain SR-flip flop and D-flip-flop

(d) Describe general stack organization of CPU.

(e) Explain register stack.

4 Attempt any two :

(a) What is Reserve Polish Notation (RPN) ? Explain the use of RPN to evaluate arithmetic expressions using suitable example.

(b) What do you mean by interrupt? Describe different types of interrupt.

(c) Draw the block diagram of ALU. explain how it works.

5 Attempt any two :

(a) Explain memory bus and I/O bus in detail.

(b) What is an IOP? Draw the block diagram of computer with IOP. Explain how IOP is useful.

(c) What is DMA? Explain DMA controller.

1 Answer the following questions : (any two)

(a) What is FLIP-FLOP? Explain JK flip-flop and D-flipflop.

(b) What is combinational circuits? Explain full – Adder circuit in detail.

(c) What is Boolean Algebra? Simplify the following Boolean expressions using boolean algebra :

(i) A'B + ABC' + ABC (ii) AB + A (CD + CD') (iii) A'BC + AC

2 Answer the following questions :

(a) Write a short note on Decoders

(b) Write a short note on multiplexers

(c) Simplify the following boolean functions using four variable maps :

(i) F (A,B,C,D) = (3,7,11,13,14,15) (ii) F (A,B,C,D) = (0,2,4,5,6,7,8,10,13,15)

(d) Using Demorgan's theorem, show that,

(i) (A+B)' (A'+B') = 0 (ii) A + A'B + A'B' = 1

(e) Convert the expression into reverse polish notation:

(i) A * (B+C (D+E)) * F * (G+H) ii) A* B/C + (E+F+G) – H * I

3 Answer the following questions :

(a) Write a note on cache memory.

(b) Write a note on main memory.

(c) Explain Asynchronous Data transfer.

(d) Explain DMA in detail.

(e) Explain: Memory mapped I/O V/s. Isolated I/O

4 Answer the following questions :

(a) Explain Input-Output processor.

(b) Explain the term :Content addressable memory, Control word

(c) Explain input-output interface.

(d) Explain Stack Organization.

(e) Explain the term logic gates and explain following gates : (i) NOR (ii) NAND.

5 Answer the following questions :

(a) List various addressing mode and explain any two.

(b) Write one address instruction for evaluating following expressions : X = (A+B) * (C+D)

(c) Write a note on Registers.

(d) Find 2's complement of 0 1 0 1 0 1 1 1

(e) Convert following arithmetic expressions from reverse polish notation to infix notation :

(i) A B C D E + * – / (ii) A B C D E F G + * + * + *