DATA STRUCTURE QUESTION BANK

UNIT 1

a) What are the various operations associated with word processing? How they are implemented using basic string operation.

b) Consider the pattern P = a b a2 b . Construct the table and the corresponding labelled directed graph used in second pattern matching algorithm.

a) Find the table and corresponding graph for the first pattern matching algorithm where the pattern P - ab ab ab.   &   P= a^3bb

b) How do you understand that an algorithm is complex? hence explain the complexity.

Q1.Describe the complexity of pattern matching algorithm. Hence prove the complexity off first pattern matching algorithm is $O(n^2)$).

Q.2 Explain the string operation in view of extracting a character or letter group of characters and count the length of string.

Q3.find the table and corresponding graph for the second pattern matching algorithm where the pattern P=abaab.

Discuss the mathematical / logarithmic notations & functions used in data structure basic.

Q. Consider the pattern p = abc use slow pattern matching algorithm to find number of comparisons to find the INDEX of p in each of the following texts T :

(a) a^{20}

(b) $(abc)^{10}$

(c) $(cbab)^{10}$

(d) d^{10}

1 Give the comment on 'Algorithm and Complexity' along with example.

2.Suppose T is the text "I AM HAPPY". Use appropriate syntax to change T so that it reads:
1)"I AM UNHAPPY." 2)"I AM HAPPY AND ROAMING" 3) "TODAY I AM HAPPY"

B) Describe types of structures used for storing string.

(a) Suppose S ='JOHN PAUL JONES'

T = 'A' THING of BEAUTY IS A JOY FOREVER.

(i)   Find length of string S and T
(ii)   Find : (a) SUBSTRING (s, 4, 8)   (b) SUBSTRING (T, 10, 5)

 (iii) Find : (a) INDEX (T, 'UTY) (b) INDEX (S, 'JON') (c) INDEX (i, 'Jo) 8

(b) Prove that the complexity of first pattern matching algorithm is O(n2)

Q. Consider the pattern P = abc using slow pattern matching algorithm, calculate the number of comparisons to find the index P in the following text T.

i) $(bca)^8$ ii) $(ab)^{10}$ iii) $(abc)^5$ iv) $(ab)^{20}$

Suppose T is the text "DATA STRUCTURES IS EASY". Use appropriate syntax to change T so that it reads:
 "THE DATA STRUCTURES IS NOT EASY"
"THE DATA STRUCTURES IS EASY BUT COMPLEX"
" NOW DATA STRUCTURES IS EASY"

Q -For each of the following pattern P and texts T, find the number C of comparisons to find INDEX of P in T using slow algorithm.

. Explain the string operation
1)SUBSTRING
2)INDEX
3)//
4)LENGTH

i)   P= aaa   T= (aabb)^3
ii)   P= abc   T= (ab)^5
iii)   P=aaba   T = abaababb

a) Explain following string operations. D SUBSTRING ii) t11) tt iv) INDEX t, FNGTH

UNIT 2

1) Explain the concept of sparse matrix representation thus describe the algorithm.

2) Write an algorithm of linear array A, hence illustrate the Insertion and deletion process

3) What do you understand the binary search's Hence explain with an algorithm

4) Justify the advantages if any of a linear array list over pointer array list for at least three operations.   . Give the comment on record and record structure.

5) Consider fie string S = 'AMRAVATI Apply bubble sort to arrange the characters in S in alphabetical order. Show all passes. Also find the number of comparisons and number of exchanges.

6.Differentiate between: (i) A record and A linear array (ii) A triangular matrix and a tridiagonal matrix

7.Write algorithm of insertion in Linear array with example.

A:- 25, 38, 42, 45,53,68, 99.Apply binary search to DATA for searching a ITEM=25. show the steps in applying the binary search to this array.

8.Assuming that an array A contain the following numbers. A : 25, 31t, 42, 45, 53, 68, 99 Apply the binary search to find 99 from an array. Show all passes. Also write algorithm for binary search.

9.Suppose multidimensional arrays A and B are declared :
A(-2:2,7:22) and B (l:8, -5:5, -10:5)   A(-5:5,3:33) and B(3:10,1:15,10:20).
i.Find length of each dimension & the number of elements in A & B
 ii) Consider the element B[3,3,3] in B & find the effective indices E1, E2, E3 and address of the element assuming Base (B) = 400 and there arc w=4 words per memory location when row major order representation.   B[5,10,15] in B.

10.Explain the concept of sparse matrices. Also explain its representation.

11. a) write algorithm of linear array A. i) Inserting into array A. ii) Traversing array A.

12. Following is a list of entries, with level numbers in a students record
1 Student 2 Number 2 Name
3 Last 3 Fist 3 MI (Middle Initial)
2 Gender 2 Birthday 3 Day 3 Month
3 Year 2 SAT 3 Math 4 Verbal
i)Draw corresponding hierarchical structure.
ii) Which of the items are elementary items?

6. Consider the arrays AAA(5:50), BBB(-5:10) and CCC(18). a) Find no elements in each array
b) Suppose Base(AAA)=300 and w=4 words per memory cell for AAA. Find the address of AAA[15], AAA[35]and AAA[55]

7.Consider string S= "FOREST" using bubble sort algorithm arrange the character in S in alphabetical order and show all passes.

13. Give and explain the algorithm for Binary Search.

 8. Consider the string S= TADOBA . Apply bubble sort to arrange the character in S in alphabetic order . Show all passes and also find the number of comparisons and number of Interchanges

14. Using Bubble sort algorithm, find the number C comparisons and the number D of interchanges which alphabetize the n = 6 letters in PEOPL.   n=6 letters in JUNGLE

15. what do you mean binary tree traversal ? Explain with an example.

16. Explain bubble sort method for the array list A having following content
 A :24,34,14,19, 15,8,9 Thus discuss the algorithm.

17. Compare the triangular matrix & Tridiagonal matrix hence discuss their importance and applicability. Illustrate with suitable example.

18. write an algorithm for insertion of an element as well as deletion in linear array assume suitable data and illustrate the method.

19. Give the representation of a two dimensional array.

 20) Consider string s = 'Mumbai' using the bubble sort algorithm arrange the character in S in alphabetical order, Show all passes.

21. Let A be an nxn square matrix sorted in the form of a two dimensional array. Write an algorithm to find sum of elements above the diagonal.

 22) Write an algorithm for primary search and obtain an expression for its complexity.

UNIT -03

Q1. What is linked list? Explain the advantages of link list over array Hence describe the algorithm for searching link list. 7 Mark

Q2. Write procedure for printing information at each node on a linked list and counting the number of nodes on linked list. 6 Mark

Q3. Explain the advantages of linked list over the Queue. Thus justify the importance of Header linked list and two way linked list. 6 Mark

Q4. Consider a polynomial P(x,y,z) in variable x, y and z
P $(x, y ,z) = 8x^2 y^2 Z - 6yz^8 + 3 x^3Yz + 2xy^7z - 5x^2y^3 - 4xy^7z^3$
 i) Rewrite the polynomial so that the terms are ordered.
 ii) Suppose the terms are stored in linear Array COEF, XEXP, YEXP, ZEXP with the head node first. Assign values to link so that link list contain the ordered sequence of term.   7M

Q5. Write a procedure which removes the first element of the list and add it to the end of list without changing any values in INFO.   7M

Q6. Write an algorithm to reverse the contents of a linked list.   6M
  6. Write an algorithm for deleting a given node from a linked list with an example.

    10.Describe the algorithm for searching an element in linked list.

Q7. Write procedure for : (i) Printing in formation at each node on a linked list. (ii) Counting the number of nodes on linked list. 7M

Q8. What do you mean by linked list ? Give and explain the representation of linked list in memory.

Q9. Write an algorithm INSLOC (INfO, LINK, START, AVAIL. LOC. ITEM) to insert ITEM so that ITEM follows the node with location LOC or insert ITEM as the first node when LOC =NULL.   7M

Q10. Describe the algorithm for searching a linked list. i) For unsorted list. ii) For sorted list. 7 M

Q.11 Explain the following terms :

(i) Header linked list
(ii) Two Way Linked list   6M

Consider the following polynomial equation:
P(x, y, z) =2xy^2z^3+3x^2yz^2+4xy^3z+5x^2y^2+6y^3z+7x^3z+8xy^2z^5+9
i) Rewrite the polynomial so that the terms are lexicographical order.
ii) Suppose terms are ordered in the parallel arrays COEF, XEXP, YEXP, ZEXP with
HEAD nodes first. Assign values to LINK so that the linked list contains the ordered sequence of term

Q12. What are the advantages and disadvantages of linked List over arrays ? 6M

Q13. a) Describe the term Garbage collection. overflow and underflow. Explain the remedial solution of them.

Q14. Let P(x) denotes the polynomial draw the diagram representing P(x) by header list with array structure $P(x) = 4x^9 +2x^7 - 15x^5 +10x^2$ -2

Q15. Describe the linked list structure illustrate with an example the traversing of linked list.

Q16. Explain the insertion and deletion operation on linked list. Thus list out at least three advantages of linked list.

Q17. Let LIST be a linked list in memory containing integer numbers. Write an algorithm to find. Sum of Even numbers on the list.

Q18. Write a procedure which removes the first element of the list and add it to the end of list without changing any values in INF.

UNIT-04

Q. Suppose S is the following list of 14 alphabetic characters
 S : DATA-STRUCTURES Using quick sort arrange them in alphabetic manner and find the final position of character D in the list.

Q.Suppose A is following list of l2 numbers. 44, 33, 11, 55. 77, 90, 40, 60, 99, 22, 88, 66. Using quick sort algorithm orange it in ascending order Show all the steps.

Q. A list L contains character string using quick sort arrange them into ascending alphabetic order and also find the location total element "E.   L = SANTGADGEBABAAMRAVATI

Q .Consider the following postfix expressions P and evaluate using
    algorithm: (i) P: 13, 8, 6, -, / , 2 , /, 5, +, *, +

10. Suppose STACK is allocated N=6 memory cells and initially STACK is empty
i.e.TOP=0. Find the output of the following module. 1) Set A=2 and B=5
2) Call PUSH (STACK, A)   3) Repeat while TOP != 0
Call PUSH (STACK, 4)   Call POP(STACK, ITEM)
Call PUSH (STACK, A+B)   Write : ITEM
Call PUSH (STACK, B+5)   [End of loop]
Call PUSH (STACK, 9)   4) Return.

4. Let J and K be the integers and suppose Q(J,K) is recursively defined by
Q(J,K) = 5   if J<K
        =Q(J-K, K+2) + J   if J>=K
Find Q(2 ,7), Q(5, 3) and Q(15, 2).

Let a and b denotes the positive integers and suppose a function Q is recursively defined by
Q(a,b) = 0   if a<b
        =Q(a-b, b) + 1   if b<=a
i. Find the values of Q(2 ,3) and Q(14, 3).

(iii)   P: 8, 9, 3, +, *, 13 , 4, /, -   ii. What does this function do? Find Q(5861,7)

Q. What do you understand the queue? How many types of queue can be formed? Discuss the priority queue.

Q. What is stack? Give the procedure to PUSH and POP an item for linked stack. Translate lhe following infix expression into equivalelt post fix Expression

i) (A-B) * (D-E)   I) ((A+B) D) / (E-F)+G
ii) (A+B ↑D)/(E-F) *G   II) (A-B)*(D/E)
iv)   A * (B-C)/(D-E)* F   III) A*(B+D)/E-F*(G+H/K)
                                IV)   (A + B) * C - D/F

Q. What is priority queue ? Give different representation of a priority queue.

Q. what is Queue? write an algorithm for insertion & deletion of element from queue assuming linked list representation.

Q. Explain with a suitable example the recursive procedure using stack and Queues.

Q. write an algorithm for evaluation of postfix expression.

Q. Explain Ackermann function. find out A(2, 2) using same function.

UNIT-5

Q. What do you understand the binary tree and their representation in memory?

Q. Explain traversal of one way ordered threaded binary tree.

Q. Draw the binary tree for the following expression
(M * N + O * P) / (R+S)

Q. Discuss the sorting methods Hence explain the heap sort algorithm with its advantages.

Q. A Binary tree T has 9 nodes. The inorder and preorder traversal of T yields following sequence of nodes. Draw Tree.
Inorder: E A C K F H D B G
Preorder : F A E K C D H G B

Q. Suppose an array A contains 8 elements as follows :
55, 66, 22, 88, 44, 33, ,17
 Apply Insertion sort algorithm to arrange the list in descending order Show all the passes and result.

Q. Suppose a binary tree is in memory. Write recursive procedure which finds the depth DEP of T.

Suppose an array A contains 8 elements as follows : 4, 3, 2, 10, 12, 1, 6, 5. Apply Insertion sort algorithm to arrange the list in ascending order. Show all the passes and results.

Q. Consider the following data items and corresponding weights as follows:
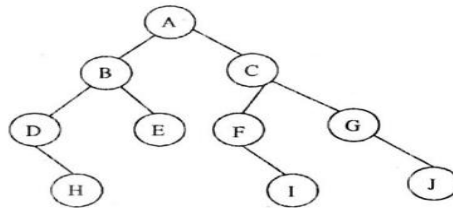Data Item A B C D E F G H
Weight   22 5 11 19 2 11 25 5
Construct the Huffman Tree.

Data Item   A B C D E F G   H
Weight   2 7 24 32 37 42 42 120

Q. Traverse the given tree using Inorder, preorder and Postorder traversal. Show step by step traversal for all nodes

a) Let E denote the following algebric expression.
E : [a + (b − c)] * [(d − e)/(f + g − h)]
   i)   Draw Binary Tree.
   ii) Find out preorder & postorder traversal of tree.

b) What is one way and two way inorder threaded binary tree? Draw the same for given binary tree. Also draw Two-way threaded tree with header node.
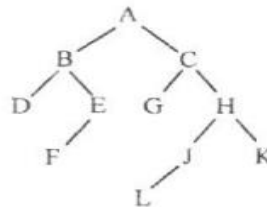
a) A Binary tree T has some nodes. The inorder & preorder traversal of T yeilds following sequence of nodes. Draw Tree.
   Inorder : Q B K C F A G P E D H R
   Preorder : G B Q A C K F P D E R H

Suppose the following list of letters is inserted in order into an empty binary search tree :
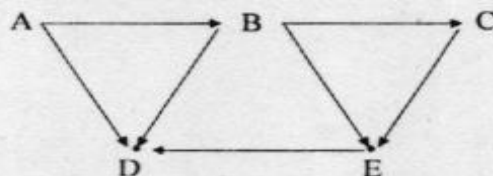J, R, D, G, T, E, M, H, P, A, F, Q.
   i)   Find the final tree T and
   ii) Find the inorder traversal of T.
   iii) Find the new tree after node M is deleted.
   iv) Now delete node D.

(a) A Binary tree T has 9 nodes. The inorder and preorder traversal of T yield the following sequence of nodes :

   Inorder : E   A   C   K   F   H   D   B   G
   Preorder : F   A   E   K   C   D   H   G   B   7

(b) Consider the graph G shown below :

Obtain the linked representation of this graph, find the changes in linked representation of the graph G if a node F is added to the graph, Edge (A, F) is added to the graph. Redraw the resultant graph.   6

(a) Consider the algebraic expression :

E = (2x + y) (5a − b)³

(i) Draw the tree T which corresponds to the expression E.

(ii) Find Preorder traversal of tree T.

(iii) Find Postorder traversal of tree T.   6
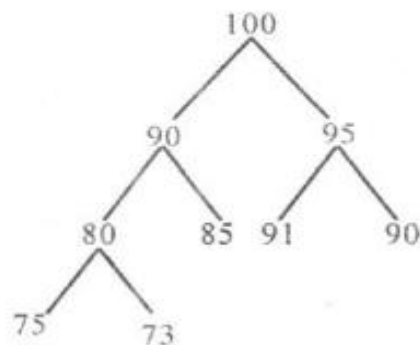
(b) Suppose a Binary tree T is in memory. Write a recursive procedure which finds the depth
DEP of T.   7

a) Draw a binary tree for following expression.
A*B−(C+D)*(P/Q).

b) Consider the following Heap.

Suppose a new node 100 is to be inserted show all the steps required for insertion.

a) Write an algorithm for post order traversal of a binary tree.

b) What is one way and two way in order threaded binary tree? Explain with example.

UNIT-6

Q. Explain sequential representation of graphs. Illustrate its advantages and disadvantages

Q. Discuss the Warshall Algorithm. Justify with an example to find out the shortest path.

Q. Compare the features of selection sort and Radix sort procedure. Thus justify the situation where the selection sort is better than radix sort.

Q. Explain the linked representation for the graph and hence describe the traversal of the graph.

Q. Assume that an array A contains the following elements : A : 80. 90. 70. 60, 50. 35. 20 Apply selection sort to sort the elements of A in ascending order What will be best case for this algorithm ?

Q. Suppose 8 cards are punched as follows :82, 901, 100, 12, 150, 77, 55, 23. Given to a card sorter. Apply Radix sort to sort the numbers in three phases. What is the complexity of the Radix sort algorithm?

Q. Explain different ways to represent Graph in memory with example.

(b) Consider the Graph and where nodes are stored in an array DATA as follows:
DATA : X, Y, Z, W The graph is as follows :
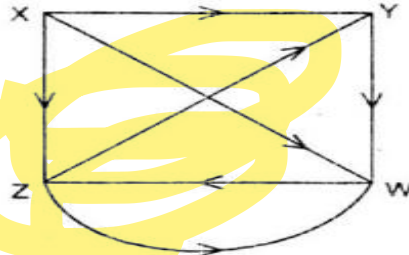
(i) Find adjacency matrix A of Graph G

(ii) Find path matrix P of G.

(iii) Is graph strongly connected ?   7

6. Write the algorithm for Depth First Search of Graph
Write an algorithm for depth first search of graph.

Suppose 9 cards are punched as follows :
348, 143, 361, 423, 538, 128, 321, 543, 366
Given to a card sorter. Apply Radix sort to sort the numbers in three phases. What is the
complexity of Radix sort algorithm.

a) Consider the graph G where nodes are stored in an array DATA as follows :
DATA : X, Y, Z, S, T
The graph is as follows :
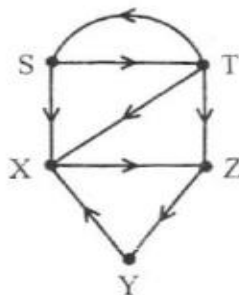
i) Find the adjacency matrix A of graph G.
ii) Find the path matrix P of G.
iii) Is the graph strongly connected?

b) Assume that an array A contain the following elements :
A : 77, 33, 44, 11, 88, 22, 66, 55
Apply selection sort algorithm to arrange this in ascending order. Show all the passes and
results.

(a) Suppose 9 cards are punched as follows :

   348, 143, 361, 423, 538, 128, 321, 543, 366

Apply Radix sort to sort the numbers in three phases.   7

(b) Suppose array A contains 14 elements as follows :

   66, 33, 40, 22, 55, 88, 60, 11, 80, 20, 50, 44, 77, 30

Apply merge sort algorithm to arrange this list in ascending order. Show all passes and remits.   7

(a) Explain Warshall's algorithm for finding the shortest path with suitable example.

(b) Explain with an example the linked list representation of a graph.

Consider the graph G where nodes are sorted in an array DATA as follows
DATA : X, Y, Z, W
the graph is as follows.
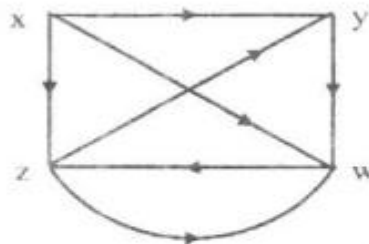
i)   Find the adjacency matrix A of the Graph G.
ii) Find the path matrix P of G using power of the adjacency matrix A.
iii) Is the Graph strongly connected?

Explain with an example the LinkedList representation of a graph.

a)   Write an algorithm for Dept First search of Graph.

b)   Assuming that an array A contain the following numbers A: 15, 20, 25, 8, 16, 52 Apply selection sort to sort A.