WINTER-2018

UNIT 1

Q.1 a) Consider the algebraic expression. $(7x + y)(5a - b)^3$.

i. Draw corresponding tree diagram.

ii. Find the scope of exponential operation. **(7)**

b) A hospital maintains a patient's file in which each record contains the following data:

NAME, ADMISSION DATE, SSN NUMBER, ROOM NUMBER, BED NUMBER, DOCTOR:

i. Which item can serve as Primary Key?

ii. Which pair of item can serve as a primary Key?

iii. Which item can be group item? **(7)**

Q.2 a) Consider pattern P = aaa bb, Construct the table and labeled directed graph by using fast pattern matching algorithm. **(7)**

b) Describe briefly the three types of structure used for storing strings. **(7)**

UNIT 2

Q.3 a) Using Bubble sort algorithm to find the number of comparison and number of interchanges which alphabetized the Letter CINATTI (i.e sorted to A C I I N T T). Show all intermediate steps. **(7)**

b) Consider the arrays A and B declared as follows:

A (-2 : 2, 2 : 22) and B(1 : 8, -5 : 5, -10 : 5)

i. Find length of each dimension and number of elements in A and B.

ii. Consider element B[3, 3, 3] in B. Find effective indices E_1, E_2 and E_3 and the address of the element, assuming Base (B) = 400 and three are w = 4 words per memory location column major order. **(6)**

Q.4 a) Let DATA be the 13 element array.

DATA : 11, 22, 30, 33, 40, 44, 55, 60, 66, 77, 80, 88, 99

Apply binary search the item = 40. Show all steps. **(7)**

b) Consider the 25 × 4 matrix array SCORE. Suppose Base [SCORE] = 200 and there atre w = 4 words per memory cell. Find the address of the SCORE [12, 3], if the programming language stores two dimensional array using row major order. **(6)**

UNIT 3

Q.5 a) Consider the following Polynomial expression **(7)**

$$P(x, y, z) = 7x^3z + 5x^2y^2 + 3x^2yz^2 + 4xy^3z + 8xy^2z^5 + 2xy^2z^3 + 6y^3z + 9.$$

1. Rewrite the polynomial expression so that the terms are ordered Lexicographically.
2. Suppose that the term are stored in parallel arrays COEF, XEXP and ZEXP with Header node first. Assign values to an array LINK so that the linked list contains the ordered sequence of terms.

b) Consider a list of five hospital patient and their room numbers.

1. Fill in the values for NSTART and NLINK so that they form alphabetical listing of the names.
2. Fill in the values of RSTART and RLINK so that they form ordering of the room numbers.

N START ☐

R START ☐

	NAME	ROOM	NLIMK	RLINK
1	Brown	650		
2	Smith	422		
3	Adams	704		
4	Jones	462		
5	Burns	632		

Q.6 a) Give the algorithm that insert an item into a linked list following a node with location LOC or inserts item as the first node when LOC = NULL. **(7)**

b) Let LIST be a linked list in memory. Write a procedure to find number of times a given ITEM occurs in the list. **(6)**

UNIT 4

Q.7 a) Using stack, convert the infix expression into equivalent postfix expression. Show all steps:

Q : 5 * (6 + 2) – 12/4 **(7)**

b) Let J and K be the integers and suppose Q(J, K) is recursively defined by $Q(J,K) = \begin{cases} 5 & \text{if } J < K \\ Q(J-K, K+2) + J & \text{if } J \geq K \end{cases}$

i. Find Q (2, 7) **ii.** Q (5, 3) **iii.** Find Q (15, 2) **(7)**

Q.8 a) Suppose S is the following list of n = 5 numbers. 10, 20, 30, 40, 50. Find the number of comparison to sort S using quicksort algorithm. What general conclusion can be made if any? **(7)**

b) Consider the deque where DEQUE is allocated 6 memory cells: LEFT = 2, RIGHT = 5

DEQUE : ____, London, Berlin, Rome, Paris.

Describe deque including LEFT and RIGHT, as the following operations takes place.

i. A then is added on the left.

ii. Two cities are deleted from the right

iii. Madrid is added on the left

iv. Moscow is added on the right

v. Two cities are deleted from right

vi. A city is deleted from the left

vii. Oslo is added on the left. **(7)**

UNIT 5

Q.9 a) Suppose we have eight data items and corresponding weights are assigned to it.

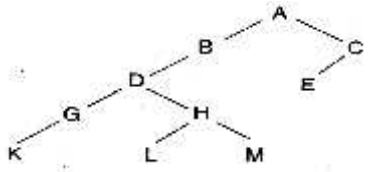
Data item	A	B	C	D	E	F	G	H
Weight	22	5	11	19	2	11	25	5

Construct the tree T with minimum weighted path length using the above data with Huffman's algorithm. **(7)**

b) Explain the following with example: **(6)**

1. One way inorder threading
2. Two way onorder threading
3. Two way threading with header node.

Q.10 a) Consider the binary tree T. Simulate the postorder traversal showing the contents of the stack. **(7)**



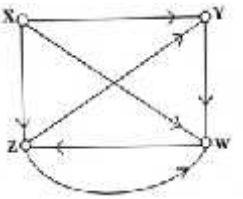
b) Build the heap from the following list of number : Show each step: 44, 30, 50, 22, 60, 55, 77, 55 **(6)**

UNIT 6

Q.11 a) Consider the graph G Suppose the nodes are stored in memory in an array DATA as follows: **(7)**

DATA : X, Y, Z, W

1. Find adjacency matrix A of graph G.
2. Find path P of G using powers of the adjacency matrix A.
3. Is G strongly connected.



b) Suppose an array A contain 8 element as follows:

77, 33, 44, 11, 88, 22, 66, 55

Apply selection sort algorithm to A. Show each pass. **(6)**

Q.12 a) Explain the algorithm for Depth first search. **(7)**

b) Suppose 9 cards are punched as follows

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

Apply radix sort to sort the number in three passes. **(6)**