WINTER-2016

UNIT 1

Q.1 a) Consider the pattern P = abc using slow pattern matching algorithm. Calculate no. of comparisons to find the index of P in following text T:

    i. $(bca)^8$,   **ii.** $(ab)^{10}$,   **iii.** $(abc)^5$.   **(7)**

b) What are the various operations associated with word processing? How they are implemented using basic string operations? **(6)**

Q.2 a) Consider the pattern P = a^3ba, construct the table and corresponding labelled directed graph used in 'fast' pattern matching algorithm. **(7)**

b) Give the comment on "Algorithm and its complexity" along with example. **(6)**

UNIT 2

Q.3 a) An array contains 25 positive integers. Write a module which:

    i. Find all pairs of elements whose sum is 25.

    ii. Find number EVNUM of elements of array which are even and the number ODNUM of elements of Array which are odd. **(8)**

b) Explain the algorithm for Binary Search. **(6)**

Q.4 a) Consider multi dimensional array A and B are declared using A (–2 : 2, 2 : 22) and B (1 : 8, –5 : 5, –10 : 5):

    i. Find the length of each dimension and no of elements in A and B.

    ii. Consider the element B [3, 3, 3] in B. Find effective indices E_1, E_2 and E_3 and address of element, assuming Base (B) = 400 and there are w = 4 words per memory cell. **(8)**

b) Explain the concept of sparse matrix. Also explain its representation in memory. **(6)**

UNIT 3

Q.5 a) Give algorithm that deletes the node N with location LOC. LOCP is the location of the node which precedes N or when N is first node, LOCP = NULL. **(7)**

b) Suppose DATA is a list in memory. Write an algorithm which copies DATA1 into another list DATA2. **(6)**

Q.6 a) Write an algorithm for reversing linked list. **(6)**

b) Consider the following polynomial P(x, y, z):

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

   i. Rewrite the polynomial so that terms are ordered.

   ii. Suppose terms are ordered as shown in problem statement in the linear arrays COEF, XEXP, YEXP, ZEXP with HEAD node first. Assign values to link so that linked list contains ordered sequence of terms. **(7)**

UNIT 4

Q.7 a) Let a and b denote positive integers. Suppose a function Q is defined recursively as follows:

$$Q(a, b) = \begin{cases} 0 & \text{if } a < b \\ Q(a - b, b) + 1 & \text{if } b <= a \end{cases}$$

Find value of Q(2, 3) and Q(14, 3). **(7)**

b) Supposes S consists of following letters:

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Suppose the character in S are to be sorted alphabetically. Use quick sort algorithm to find final position of first character M. **(7)**

Q.8 a) What is Tower of Hanoi problem? Write an algorithm which gives the solution for n disk using recursion. **(7)**

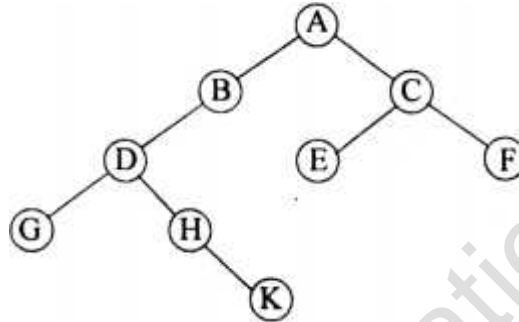**b)** Using stack, translate following in fixed expression into its equivalent post fix expression. Show all steps:

    i. Q: ((A + B)/D) ↑ ((E – F) * G),

    ii. Q: (A – B) * (D/E),

    iii. Q: A * (B + D)/E – F * (G + H/K).   **(7)**

UNIT 5

Q.9 a) Consider the following binary tree:

Give steps for preorder traversal and post order traversal of this binary tree using stacks.   **(7)**

b) Suppose following list of letters are inserted in order into an empty binary search tree T:

    J, R, D, T, E, M, H, P, A, F, Q

    i. Find the final tree T, **ii.** Find the inorder traversal of T.   **(6)**

Q.10 a) Suppose A, B, C, D, E, F, G, H are data items and suppose they are assigned weights as follows:
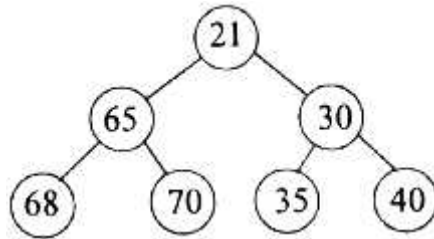
Data Items:	A	B	C	D	E	F	G	H
Weight:	20	5	10	18	1	10	22	5

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

b) Explain: **i.** Heap,   **ii.** Binary search tree.   **(6)**

UNIT 6

Q.11 a) Consider binary tree:

```
            (21)
          /      \
       (65)      (30)
       /   \     /    \
    (68)  (70) (35)  (40)
```

Which representation will be efficient to store the above tree? Give the representation and justify your answer. **(7)**

b) Explain: **i.** Threaded Binary Tree, **ii.** 2 Tree. **(6)**

Q.12) Discuss the linked representation of a graph. Let a graph G is stored in memory as follows:

Node	A		C	E		D		B
Next	4	0	8	0	7	3	2	1
Adj	6		1	10		2		9
	1	2	3	4	5	6	7	8

	START = 6		AVAIL = 5							
Dest	8	8		1	4	3	3		6	3
Link	5	7	8	0	0	0	0	0	4	0
	1	2	3	4	5	6	7	8	9	10
				AVAIL = 3						

i. Draw the graph.

ii. Find the changes in the linked list representation of the graph G if a node F and edge (E, F) and (F, D) are inserted into G. **(13)**