B. TECH.

FOURTH SEMESTER EXAMINATION, 2001-2002
DATA STRUCTURE USING 'C'

Time : Three Hours   *Total Marks : 100*

Note : Attempt ALL questions.

1.   Attempt any FOUR of the following :—   (5×4)

(*a*)   Describe, in brief, the various data structures.

(*b*)   Calculate the address of X [4, 3] in a two dimension array X [1--5, 1--4] stored in row major order. Assume the base address to be 1000 and that each element requires 4 words of storage.

(*c*)   A recursive function f is shown below. What is the value of $f(5)$?

```
int f (int x)
{
    if (x < 2)
        return 1 ;
    else
        return f(x–1) + f(x–2);
}
```

(*d*)   Draw a linked and vector representation of the sparse matrix of the following matrix :—

$$\begin{bmatrix} 0 & 12 & 0 & 0 \\ 0 & 11 & 0 & 0 \\ 9 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

(e) Implement transposition of a sparse matrix in 'C' language.

(f) Write a 'C' program to display the content of pointers using an array of pointers.

2. Attempt any FOUR of the following :— (5×4)

(a) Convert following infix expression into postfix expression

(i) $(A-B)*x+y/(F-C*E)+D$

(ii) X and Y OR NOT (A > B)

(b) Convert A+(B*C–(D/E-F*G)*H into postfix form showing stack status after every step in tabular form.

(c) Write an algorithm to evaluate an Arithmetic expression using stack and show how the expression 3*(5–3) will be evaluated.

(d) Write down the algorithm for insertion and deletion operation performed on the circular queue.

(e) Write down the algorithm for insertion and deletion operation performed on the dequeue.

(f) Consider the following circular queue capable of accommodating maximum six elements :—

　　Front = 2,　Rear = 4

　　Queue :　　– L, M, N, – –

Describe the queue as the following operations take place :

(i) Add O　　　　(ii) Add P

(iii) Delete two letters　(iv) Add Q, R, S

(v) Delete one letter

3. Attempt any FOUR of the following :— (5×4)

(a) Write a C program to insert element in circular Linked list.

(b) Write a C program to create a single linked list and split it at the middle and make the second half as the first and vice versa. Display the final list.

(c) How will you create link list representation of a polynomial. Explain it using one example.

(d) Write short notes on Garbase collection and compaction in brief.

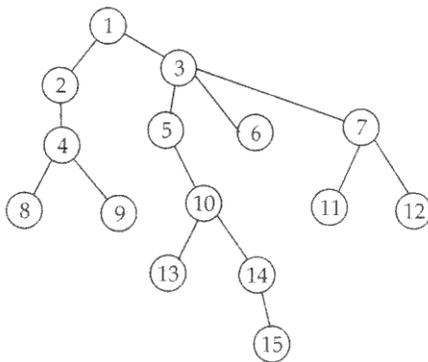(e) A Binary tree T has 9 nodes. The inorder and preorder traversals yield the following sequence of nodes :—

inorder   :   E   A   C   K F H   D   B   G

preorder :   F   A   E   K   C   D H G   B

(f) (i) Draw all possible binary tree with 3 nodes.

(ii) Draw all possible binary trees T where T is a 2 tree with 4 external nodes.

4. Attempt any FOUR of the following :— (5×4)

(a) In the following figure we see a tree :—

5. Attempt any TWO of the following :— (10×2)

(a) Define a B-tree of order m. Give Algorithm for insertion of a node in a B-tree. Build a B-tree by inserting records with following key sequence, into an empty B-tree of order 4 :—

a, g, f, b, k, d, h, m j, e, s, i, r, x, c, l, n, t, u, p.

(b) Discuss Random file organization. Explain, how insertion and deletion of records is done in this type of file organization.

(c) Explain the data organization and access mechanism on following external storage media :—

(i) Hard disk

(ii) CD-ROM