

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 1226**

**Roll No.**

--	--	--	--	--	--	--	--	--	--

**M. C. A.**

**(Semester-II) Even Semester Theory Examination, 2012-13**

**DATA STRUCTURES AND FILE HANDLING**

*Time : 3 Hours]*

*[Total Marks : 100*

*Note : Attempt questions from each Section as per instructions.*

**SECTION - A**

Attempt *all* parts of this question. Each part carries 2 marks.

2×10 = 20

- (a) What is queue and what basic operations are performed on it ?
- (b) Define tail recursion.
- (c) What is the difference between linked list and an array ?
- (d) Suppose a company keeps a linear array YEAR(1920:1970) such that YEAR[K] contains the number of employees joined in year K. Write a module to print each of the year in which no employee joined the company.
- (e) Consider the sorted array  $a[ ] = \{3, 6, 11, 25, 42, 55, 65, 75, 115, 125, 145, 150\}$ . How many comparisons are used to locate 55, 75 and 145 using binary search?
- (f) Using the bubble sort algorithm find the number of swaps (interchange) required to sort The unsorted array  $a[ ] = \{5, 10, 15, 55, 45, 35, 60, 75, 70\}$ .
- (g) What is collision in hashing ?
- (h) Describe mechanisms of deleting an element in a binary search tree.
- (i) How adjacency matrix is used to represent a graph ?
- (j) Define the properties of a B tree of order m.

## SECTION - B

Attempt any *three* parts of this question. Each part carries 10 marks.

10×3=30

2. (a) Build a heap of the following nodes having integer values :

20, 35, 9, 26, 49, 78, 2, 46

- (b) Write algorithm using appropriate data structure to check whether symbols in a given expression are balanced or not? Also discuss the working of the algorithm with a suitable example.

- (c) Ackerman's function is defined as follows :

$$\begin{aligned} A(m, n) &= n+1 && \text{if } m=0 \\ A(m, n) &= A(m-1, 1) && \text{if } m \neq 0, n=0 \\ A(m, n) &= A(m-1, A(m, n-1)) && \text{if } m \neq 0, n \neq 0 \end{aligned}$$

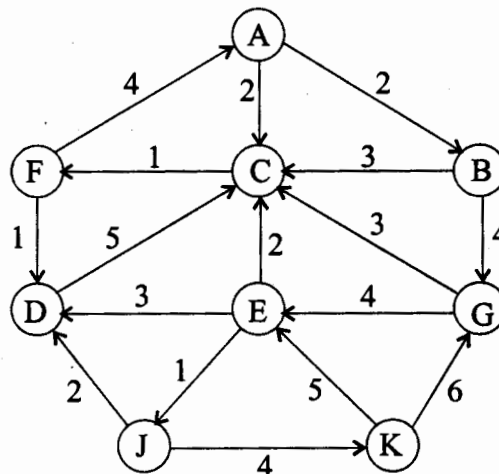
Calculate value for  $A(2, 3)$ . Show all intermediate steps of calculation.

- (d) A binary tree  $T$  has 9 nodes. The inorder and preorder traversal of  $T$  yields the following sequences of nodes :

Inoder :    E   A   C   K   F   H   D   B   G  
Preorder :   F   A   E   K   C   D   H   G   B

Draw the tree.

- (e) Consider the following directed graph. Find the minimum cost spanning tree using Kruskal's algorithm.



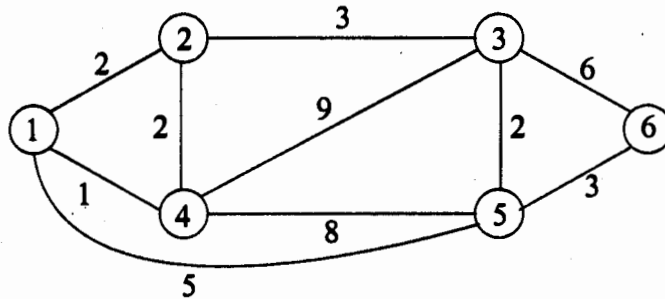
(2)

### SECTION -C

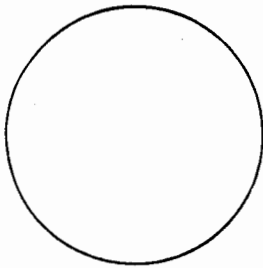
Attempt any *five* questions of this Section. Each question carries 10 marks.

10×5=50

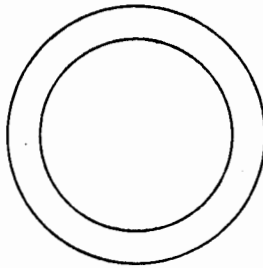
3. Using Dijkstra's algorithm, find out a shortest path, from node 1 to 6 for the graph given below.



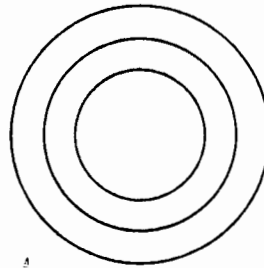
4. Write a recursive function to draw the following pattern of level  $n$ , where  $n$  is user input.



$n=1$



$n=2$



$n=3$

5. Explain sparse matrix with a suitable example and propose suitable method to represent sparse matrices.
6. Write pseudo code/program for insertion sort and do the analysis of its time complexity.
7. Construct an AVL search tree by inserting the following elements in the order of their occurrence.

64, 1, 14, 26, 13, 110, 98, 85

8. Write pseudo code/program to create and sort a singly linked list.

9. Let A, B, C, D, E, F, G and H are 8 data items whose weights are 22, 5, 11, 19, 2, 11, 25, and 5 respectively. Construct the tree with minimum weighted path length using Huffman's algorithm.