

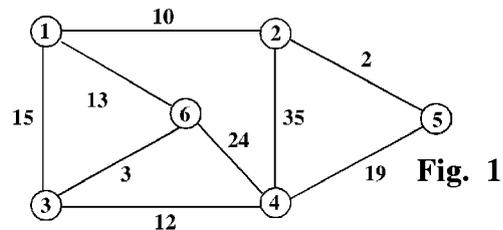
- (ii) Write a function in **C** which searches string **x** for the first occurrence of string **y**.
If **Y** does not appear in **X**, then function returns zero. Otherwise function returns starting position in **x** of the first occurrence of **y**.

2 Answer any **two** parts :

- (a) (i) Write an algorithm for evaluating **6+4=10** an expression in postfix form.
(ii) Consider the following infix expression
((a+b) + C ↑ (d+e)+f) ↑ (g+h)
Convert the expression to equivalent prefix expression and postfix expression.
The operator \uparrow is defined as $x \uparrow y = xy$
The operator $+$ is usual addition operator.
- (b) (i) State the Towers of Hanoi **5+5=10** problem. Write recursive algorithm to solve the problem.
(ii) Design a method for keeping two stacks within a single linear array so that neither stack overflows until all of the memory is used. Write a **C** function push (**x,s**) that pushes element **x** onto stack **s**, where **s** is one or other of these two stacks. Include all necessary error checks.
- (c) (i) How would you implement a **8+2=10** circular queue of integers in **C** using array. Write routines to implement the appropriate operations for it.
(ii) Differentiate between dequeue and priority queue.

- 3** Answer any **two** parts : **5+5=10**
- (a) (i) Let **p** be a pointer to the first node in a singly linked list and **x** be an arbitrary node in this list. Write an algorithm to delete the node **x** from the list. If **x=p** then **p** should be reset to point to the new first node in the list.
- (ii) Write a **C** function to concatenate two circularly linked lists pointed by list **1** and list **2** in such a way that circular list pointed by list **2** is appended to the circular list pointed by list **1**.
- (b) How can a polynomial in two variables be represented by a singly linked list? Write an algorithm to add two such polynomials.
- (c) (i) Show that the maximum number of nodes in a binary tree of height **h** is $2^{h+1} - 1$.
- (ii) Formulate an algorithm to find the number of leaf nodes in a binary tree. What is the time complexity of your algorithm?
- 4** Answer any **two** parts. **6+4=10**
- (a) (i) Write an algorithm for sorting a set of integers using Quick sort procedure. What is average case time complexity of the procedure?
- (ii) Following are the inorder and postorder traversal of a binary tree **T**.
In order : **D K I B A E G H J F C**
Post order : **K D I E A G B F C J H**
 construct the tree **T**.
- (b) (i) What is an **AVL** tree? Show at **6+4=10**
 each step the **AVL** tree built from following sequence of insertions.
8, 15, 1, 19, 16, 4, 25, 12, 23, 20, 17
 Start with empty tree. Label the rotations according to type.

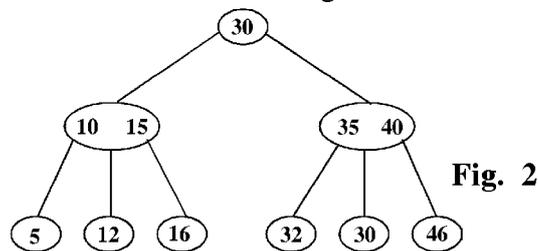
- (ii) Obtain minimum cost spanning tree for the following graph using Krushal algorithm.



- (c) (i) Write Warshall algorithm to find $5+5=10$ shortest path between any two vertices of a graph. Explain the algorithm briefly.
(ii) Write an algorithm to test whether a given graph is connected or not.

5 Answer any **two** parts : **10**

- (a) Define **B**-tree
What do you understand by order of a **B**-tree?
Consider the following **B**-tree of order **3**.



Show the B-tree after following sequence of operations.
Insert **43**, insert **50**, delete **15**

- (b) (i) Differentiate between the following : $6+4=10$
(a) **B**-tree and **B**⁺ tree
(b) Indexing and Hashing
(c) Internal sorting and external sorting.
(ii) Show that all **B**-trees of order **2** are full binary trees.
(c) Define hash function. What do you mean by perfect hash function? Discuss various methods used for resolving hash collisions.