N.B. (1) Question No. **1** is **compulsory**.

(2) Attempt any **four** questions from the remaining **six** questions.

1. (a) To write an algorithm to find the sum of series and also find its time complexity. **6**

$$S = \sum_{i=1}^{n} i^2.$$

(b) To explain min/max heap and then implement heap sort. Also derive its time complexity. **14**

2. (a) Write a program to delete an element from one dimensional array. What is time complexity of it ? **8**

(b) Write a program to sort given n integer numbers using merge sort. Drive the complexity of merge sort. **12**

3. (a) To implement the binary search, prove that the complexity of binary search is $O(\log_2 n)$. **8**

(b) Which are the different collison resolution techniques. And to implement linear probing technique. **12**

4. (a) To construct the binary tree using : **8**
   Preorder : A B D G C E H I F
   Inorder : D G B A H E I C F
   and find the post order.

(b) To construct B-tree of order-5 for the given sets of numbers :— **12**
   1, 7, 6, 2, 11, 4, 8, 13, 10, 5, 19, 9, 18,
   24, 3, 12, 14, 20, 21 and 16.
   and show the result of intermediate steps.

5. (a) What is AVL tree ? Explain four cases to balance AVL tree. To construct the AVL tree for the given numbers to be inserted one by one. **14**
   3, 5, 11, 8, 4, 1, 12, 17, 2, 6, 10.

(b) Write note on Tries. **6**

6. (a) What is graph ? Which are the different ways to represent graph. **8**

(b) To find minimum cost spanning tree for the given graph **figure**, using Prim's and Kruskal's Algorithm. **12**
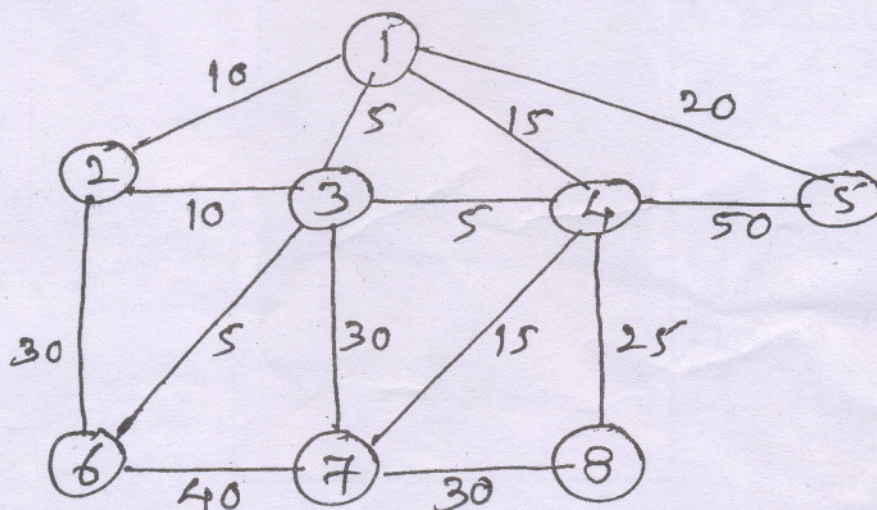
7. Write notes on : (any **two**) **20**
   (a) Transitive Closures
   (b) Digital Search Tree
   (c) Topological Sorting.