

**AMIETE – CS/IT (New Scheme)**

Time: 3 Hours

**December - 2017**

Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

**NOTE: There are 9 Questions in all.**

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

**Q.1 Choose the correct or the best alternative in the following: (2×10)**

- a. The time complexity of an algorithm is measured in terms of  
(A) execution time in microseconds (B) number of key operations  
(C) number of statements (D) number of variables used
- b. Find the odd data structures  
(A) Stack (B) Queue  
(C) Tree (D) Double Linked List
- c. If the sequence of operations push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop are performed on a stack, the sequence of popped out values are \_\_\_\_\_.  
(A) 2, 2, 1, 1, 2 (B) 2, 2, 1, 2, 2  
(C) 2, 1, 2, 2, 1 (D) 2, 1, 2, 2, 2
- d. How many binary trees can be formed with 3 nodes which when traversed in post order gives the sequence A, B, C?  
(A) 3 (B) 9  
(C) 7 (D) 5
- e. Which of the following traversal on a Binary search tree prints the elements in ascending order?  
(A) Preorder (B) Inorder  
(C) Post order (D) Level Order
- f. Which of the following search has a complexity of  $O(1)$ ?  
(A) Linear Search (B) Binary Search  
(C) Search on Binary Search Tree (D) Hashing

- g. Which of the following is a characteristic of Balanced trees?
- (A) Number of elements in left and right subtree are equal
  - (B) Number of levels in the left and right subtrees differ by atmost one
  - (C) It is a complete binary tree
  - (D) Height of the left subtree is more than the height of the right subtree by one level
- h. Which of the following algorithm can be used to determine whether the given graph is connected?
- (A) Breadth First Search
  - (B) Depth First Search
  - (C) Both (A) and (B)
  - (D) Traversal cannot determine the connectedness
- i. The complexity of Bubble sort algorithm is
- (A)  $O(n)$
  - (B)  $O(\log n)$
  - (C)  $O(n^2)$
  - (D)  $O(n \log n)$
- j. What is the worst case complexity of Binary Search Algorithm?
- (A)  $O(n)$
  - (B)  $O(\log n)$
  - (C)  $O(n \log n)$
  - (D)  $O(n^2)$

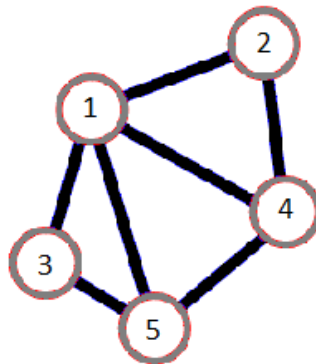
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**Answer any FIVE Questions out of EIGHT Questions.**  
**Each question carries 16 marks.**

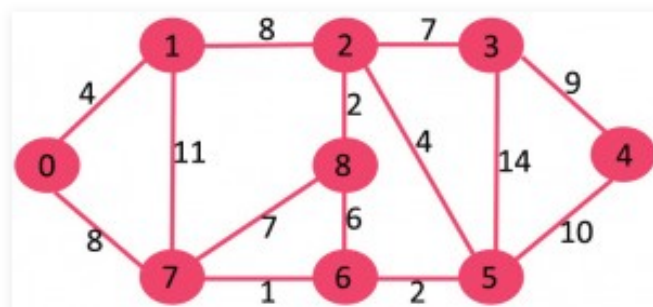
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- Q.2** a. What is an abstract data type? What are the advantages of Abstract data types? Give an example. (4)
- b. Define Big Oh notation. Linear search is a method of searching elements of an array one after the other for the presence of the given key element. Write the algorithm for Linear search. What is the worst case complexity of Linear search? (2+4)
- c. Write a C program to Program to get six numbers from user and store them in an array and find the sun of these numbers using pointers. (4)
- d. What is the function of the following segment of code? (2)
- ```
for i ← 1 to length[A]
  do for j ← length[A] downto i + 1
    do if A[j] < A[j - 1]
      then exchange A[j] ↔ A[j - 1]
```

- Q.3** a. What is a stack data structure? Write the algorithms for the basic operations on stack. (6)
- b. Explain any one application of stack. Write the corresponding algorithm. (6)
- c. What are the types of queue? Indicate the basic operations carried on a queue. (4)
- Q.4** a. Write an algorithm for the basic operations on a queue implemented using a linked list. (6)
- b. Write an algorithm to insert and delete a node from a doubly linked list. (6)
- c. What is Josephus problem? Suggest a suitable solution to this problem (4)
- Q.5** a. What is a threaded binary tree? Give an example. (4)
- b. Construct a binary search tree by inserting the following elements one by one, starting from an initially empty tree.  
10, 20, 5, 15, 25, 18, 1, 5.  
Show the tree after deleting (i) 15 and (ii) 5 (6)
- c. Draw a binary tree whose preorder traversal is **a b g c d e f** and inorder traversal sequence is **g b a d c f e**. Show the array representation of this tree. (4+2)
- Q.6** a. What are the two ways of representing graphs? Show the representation for the following graph (4)

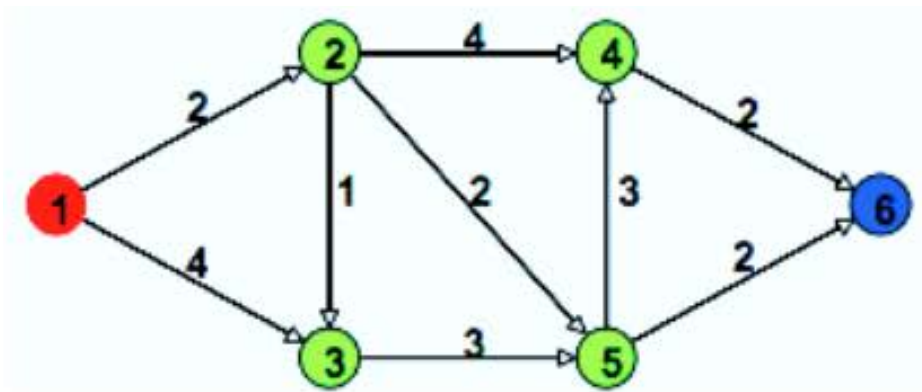


- b. Find the minimum spanning tree corresponding to the following graph:



- Explain the method and show the steps (6)

- c. Find the shortest path between vertices 1 to 5. (6)



- Q.7 a. What is hashing? Give an example. (4)

- b. What is a collision in hashing? Explain any two ways of resolving collisions. (6)

- c. Insert the key sequence 7, 18, 2, 3, 14, 25, 1, 11, 12, 1332 with hashing in a hash table with size 11. Show the final table by using the hash function  $h(k) = k \text{ mod } 11$ . Indicate the collisions and resolve them using the methods described in Q7b. (6)

- Q.8 a. Sort the following numbers using quicksort. Show the results of individual passes (6)

A=(38, 81, 22, 48, 13, 69, 93, 14, 45, 58, 79, 72,)

- b. Sort the following numbers using radixsort. Show the results of individual passes (6)

329, 457, 657, 839, 436, 720, 355

- c. Write the algorithm for Bubble sort? (4)

- Q.9 a. Write a C program to read a text file named "input.txt". Display number of spaces, vowels and number of '#' characters in the file. (8)

- b. Summarize the different stream oriented file types that can be handled in C (6)

- c. What is the purpose of closing a file? (2)