Code: AC104/AT104   **Subject: DATA STRUCTURES WITH C & C++**

AMIETE – CS/IT {𝒩𝐸𝒲 𝒮𝒞𝐻𝐸𝑀𝐸}

Time: 3 Hours   **JUNE 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. Which of the following is not a false statement about new operator?
      (A) It returns garbage value when memory allocation fails.
      (B) It automatically computes the size of the data object.
      (C) It can't be overloaded.
      (D) All of these

    b. Each array declaration need not give, implicitly or explicitly, the information about
      (A) the data type of array.   **(B)** the index set of the array.
      (C) the name of array.   **(D)** the first data from the set to be stored.

    c. In a binary tree, certain null entries are replaced by special pointers which point to nodes higher in the tree for efficiency. These special pointers are called_____
      (A) Leaf   **(B)** Branch
      (C) Path   **(D)** Thread

    d. What is the minimum number of stacks of size n required to implement a queue of size n?
      (A) One   **(B)** Two
      (C) Three   **(D)** Four

    e. What would be the asymptotic time complexity to insert an element at the second position in the linked list?
      (A) $O(1)$ **(B)** $O(n)$
      (C) $O(n^2)$ **(D)** None

    f. Linked lists are not suitable for the implementation of?
      (A) Radix sort   **(B)** Insertion sort
      (C) Binary search   **(D)** Polynomial manipulation

g. A technique for direct search is
   (A) Hashing   **(B)** Linear Search
   (C) Binary Search   **(D)** Tree Search

h. The number of interchanges required to sort 5, 1, 6, 2, 4 in ascending order
   using Bubble Sort is
   (A) 5   **(B)** 6
   (C) 7   **(D)** 8

i. The type of expression in which operator succeeds its operands is?
   (A) infix expression   **(B)** prefix expression
   (C) postfix expression   **(D)** None

j. Which indicates pre-order traversal?
   (A) Right sub-tree, Left sub-tree and root
   (B) Left sub-tree, Right sub-tree and root
   (C) Root, Left sub-tree, Right sub-tree
   **(D)** Right sub-tree, root, Left sub-tree

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

Q.2 a. Write a C program to read and print the student details using structure and
            dynamic memory allocation.   **(6)**

         b. What is an algorithm? What are the characteristics of a good algorithm?   **(5)**

         c. Explain an efficient way of storing a sparse matrix in memory.   **(5)**

Q.3 a. Convert the following infix expressions into its equivalent postfix expressions
            using a Stack.   **(8)**
            (m + n)*(k + p)/(g / b) ↑ (a ↑ c/b)

         b. What is a recursion? What is the difference between recursion and iteration? **(4)**

         c. Write an algorithm to insert an element at the front in a Double ended Queue. **(4)**

Q.4 a. What is the difference between a grounded header link list and a circular header
            link list?   **(2)**

         b. Write a program to insert a node at any position after a particular node in a
            Single Linked List.   **(8)**

         c. What is a Circular Linked List? Write an algorithm to insert an element in a
            circular link list.   **(2+4)**

Q.5 a. Prove the hypothesis that "A tree having 'm' nodes has exactly (m–1) edges or
            branches".   **(2)**

         b. Write an algorithm to delete a particular node from binary search tree.   **(6)**

         c. How do you rotate a Binary Tree? Explain right and left rotations with the help
            of an example.   **(8)**

Q.6 a. What are the different ways of representing a graph? Represent the following graph using those ways.   **(6)**
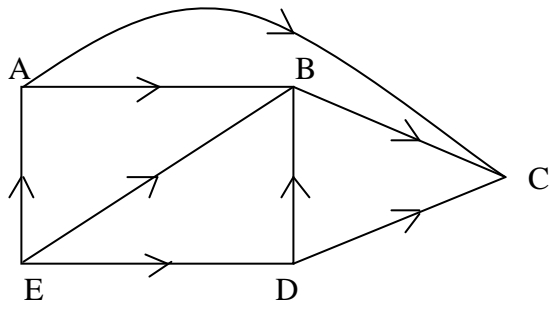
b. What is minimum spanning tree? Find the minimum spanning tree of the following graph using Kruskal's algorithm.   **(2+8)**
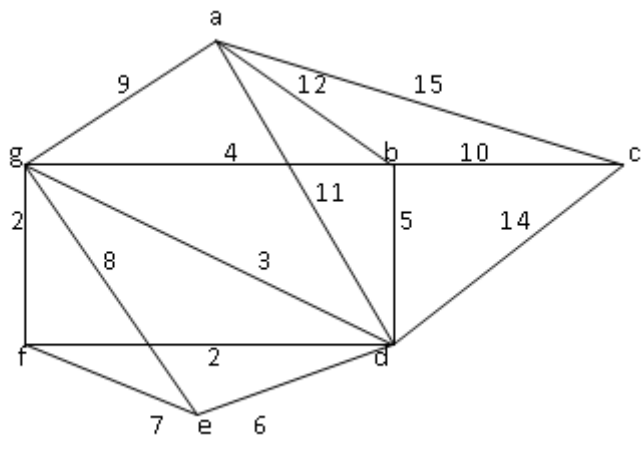
Q.7 a. Write any four characteristics of a good hash function?   **(2)**

b. Draw the hash table for the keys: 12, 44, 13, 88, 23, 94,11, 39, 20, 16 and 5 using the hash function h(i) = (2i+5) mod 11.   **(8)**

c. Write a C++ program to implement linear search technique.   **(6)**

Q.8 a. Explain the algorithm for Merge sort and sort the following values using Merge sort.   **(4+4)**

39, 9, 81, 45, 90, 27, 72, 18

b. Sort the following list using Heap Sort and show all the intermediate steps.   **(8)**
66, 33, 40, 20, 50, 88, 60, 11, 77, 30, 45, 65.

Q.9 a. Write a C program to reverse the contents of a file and print it.   **(6)**

b. Write a C Program to convert all the Characters of a file to Uppercase.   **(6)**

c. What is Indexed sequential file organization? Write the advantages and disadvantages of it.   **(4)**