

Roll No: -----



## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech.- EE / EIE (BCT)

Subject (Course): Algorithm & Data Structure

Course Code : CSEG243

No. of page/s: 03

Semester – III

Max. Marks : 100

Duration : 3 Hrs.

### Section A

(All Questions are compulsory from this section)

[5 X 4 = 20]

Q1. What is dynamic memory allocation? Explain difference between malloc and calloc?

Q2. Give a big-O estimate for  $f(x) = (x + 1) \log(x^2 + 1) + 3x^2$

Q3. A certain algorithm technique was applied to the following data set,

45, 1, 27, 36, 54, 90

After two passes, the rearrangement of the data set is given as below:-

1, 27, 45, 36, 54, 90

Identify the sorting algorithm that was applied.

Q4. Define following terms with example:

- a) strictly binary tree
- b) complete binary tree
- c) binary tree
- d) Leaf node
- e) depth of tree

Q5. Consider a 2-Dimensional array **Marks[10][5]** having its base address 2000 and the number of bytes per element of the array is 2. Now compute the address of the element, **Marks[8][5]**, assuming that the elements are stored in row major order.

### Section B

(Attempt All Questions from this Section)

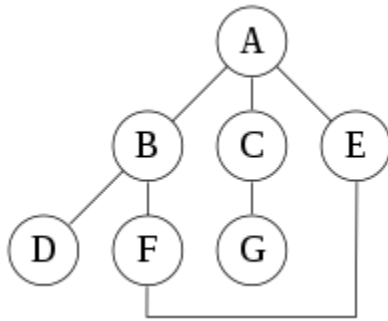
[5 X 8 = 40]

Q6. Write a program for circular queue of inserting and deleting the elements and traversing the same.

Q7. Define a structure to store the name, an array marks [] which stores the marks of three different subjects, and a character grade. Write a program to display the details of student whose name is entered by the user. Use structure definition with following information to make an array of students: - Student's Name, Roll No, DOB, Sex, Marks of - English, Mathematics & Computer Science.

Q8. How do you sort a linked list? Write a C program to sort a linked list.

Q9. Write an algorithm for Depth First Traversal technique and find the order of traversal using DFS of the following graph.



Q10. Create a binary search tree which contains the following values:

14, 10, 17, 12, 10, 11, 20, 12, 18, 25, 20, 8, 22, 11, 23 and do the following operations

- a) Preorder traversal
- b) In order traversal
- c) Post order traversal

**Or,**

A Binary tree has 9 nodes. The inorder and preorder traversals of the tree yields the following sequence of nodes:

Inorder: E A C K F H D B G

Preorder: F A E K C D H G B

Construct the binary tree.

### Section C

(Attempt All Questions from this section)

[2\* 20 = 40]

Q11. a) Write a program/algorithm to input an n digit number. Now, break this number into its individual digits and then store every single digit in a separate node thereby forming a linking list. For example, if you enter 12345, then there will 5 nodes in the list containing nodes with values 1, 2, 3, 4, 5.

b) Write the algorithm for Quick sort and show the sorting procedure for the following numbers.

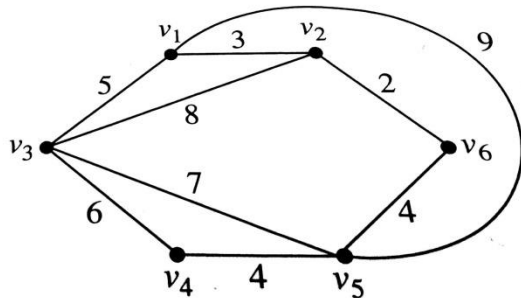
42, 23, 74, 11, 65, 58, 96, 36, 99, 98

Q12. Write the program to create a binary search tree and develop a function to perform the following operations:

- a) Search a particular value in the tree
- b) Insert a given value into the tree
- c) Delete a given value from the tree

**Or,**

Explain concept of Spanning tree in graph theory. Find Minimal Spanning tree using Kruskal's Algorithm and Prim's Algorithm both for following graph by showing all steps used in corresponding algorithm. (6+7+7)



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No. of page/s: 02

Semester – III

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Duration : 3 Hrs.

### Section A

(All Questions are compulsory from this section)

[5 X 4 = 20]

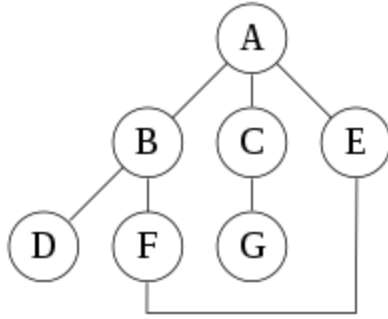
- Q1. An array is preferred instead of using a number of variables, justify this statement.
- Q2. Discuss the best case, worst case complexity involved in sorting of elements using quick sort.
- Q3. A certain algorithm technique was applied to the following data set,  
81, 72, 63, 45, 27, 36  
After two passes, the rearrangement of the data set is given as below:-  
27, 36, 81, 72, 63, 45  
Identify the sorting algorithm that was applied.
- Q4. How many nodes will a complete binary tree with 27 nodes have in the last level? What will be the height of the tree?
- Q5. A Multi-dimensional array is declared as  $Z(3:30,-5:15,10:20)$ .  $\text{Base}(Z) = 1000$  and there are 4 words per memory location.  
(i) find the length of each dimension & number of elements in Z.  
(ii) find the address of  $Z(5,10,15)$  assuming Z is stored in Row major order.

### Section B

(Attempt All Questions from this Section)

[5 X 8 = 40]

- Q6. Write a program to reverse a string using recursion.
- Q7. Write a program/algorithm to create a circular linked list and then count the number of nodes into it.
- Q8. Discuss the tree traversal techniques. And write the algorithm for any one tree traversal algorithm.
- Q9. Write an algorithm for Breadth First Search technique and find the order of traversal using BFS of the following graph.



Q10. Develop an algorithm / C program for linked list implementation of a stack.

### Section C

(Attempt All Questions from this section)

[2\* 20 = 40]

Q11. a) Develop an algorithm to search a number from an array of numbers using sequential and binary search. Give the advantage and disadvantage of both cases. Also discuss the involved complexity in each case.

b) Write the algorithm for Merge sort and show the sorting procedure for the following numbers.  
42,23,74,11,65,58,96,36,99,98

Q12. Create a binary search tree with the input given below:-

98, 2, 48, 12, 56, 32, 4, 67, 23, 87, 23, 55, 46

- i) Insert 21, 39, 45, 54, and 63 into the tree sequentially.
- ii) Delete values 23, 56, 2, 45 and 98 from the tree.

Or,

Explain concept of Spanning tree in graph theory. Find Minimal Spanning tree using Kruskal's Algorithm and Prim's Algorithm both for following graph by showing all steps used in corresponding algorithm. (6+7+7)

