UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: Btech CS+L   Semester – 5th
Subject (Course): Design and Analysis of Algorithm   Max. Marks : 100
Course Code : CSEG320   Duration : 3 Hrs
No. of page/s: 2

Instructions: Attempt all questions from **Section-A** (each question carrying *5 marks*); **Section-B** (each question carrying *10 marks*) and **Section-C** (each question carrying *20 marks*).

SECTION-A (4 x 5 = 20)

1. Illustrate the operation of counting sort on the following array.

   A = <6, 0, 2, 9, 4, 5, 3, 2, 1, 0, 3, 5, 6, 7, 7, 8, 7, 9, 0, 1, 3, 4, 6, 1, 3, 2>

2. Find big oh (O) and big theta (θ) notations for the following function:

   $f(n) = 9n^2 + 2n + 16$

3. When and how Dynamic programming Approach is applicable?

4. Explain min-max algorithm with example**?**

SECTION-B (4 x 10 = 40)

5. What is binary search? Write an algorithm to find the k-th smallest element in binary search tree. How this is better in comparison to finding k-th smallest element in an array.

6. Explain divide & conquer technique. How can this technique be used to find the minimum & maximum element out of n given elements? Write the divide and conquer based algorithm for this problem. Also, find its time complexity.

7. Explain the algorithm for quick sort. Apply it to the following list:

   (40, 80, 35, 90, 45, 50, 70) Analyze it's average and worst case time complexity.

8. Explain performance analysis of algorithm in terms of best, worst and average case?

SECTION-C (2 x 20 = 40)

9. Using Dijkstra's algorithm find the shortest path
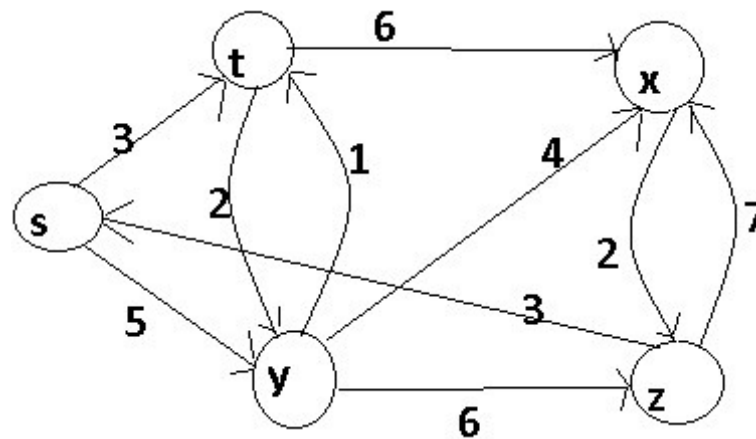
10. Discuss the Backtracking problem solving approach with the help of an N-Queens problem. Write the algorithm of N-Queens problem.

or

How can we solve the 0/1 knapsack problem using branch and bound. Use the appropriate example to explain the concept.

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SECTION-A (4 x 5 = 20)

1. What is algorithm? Explain performance analysis of algorithm with O, Ω and Θ notations?

2. Explain graph-coloring problem algorithm and find the least number of colors to paint the graph:
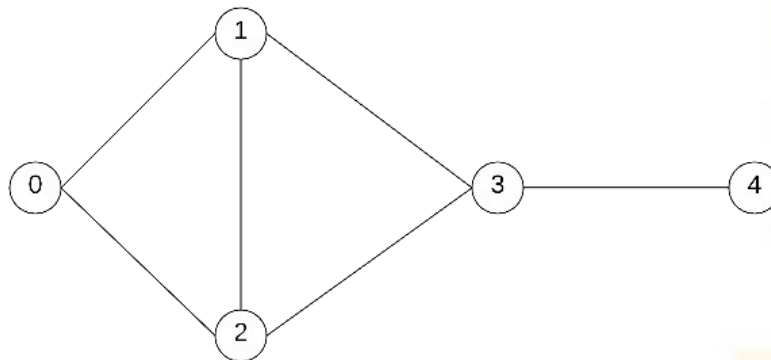
3. Explain min-max algorithm with example**?**

4. What is tree vertex splitting problem?

SECTION-B (4 x 10 = 40)

5. Explain Strassen matrix multiplication method. How Strassen matrix multiplication method outperforms the classical one.

6. Explain the algorithm for quick sort. Apply it to the following list:

A = <39, 56, 98, 40, 80, 35, 90, 43, 11, 25, 45, 50, 70> Analyze its average and worst-case time complexity.

7. What is binary search? Write an algorithm to find the k-th smallest element in binary search tree. How this is better in comparison to finding k-th smallest element in an array.

8. Explain divide & conquer technique. How can this technique be used to find the minimum & maximum element out of n given elements? Write the divide and conquer based algorithm for this problem. Also, find its time complexity.
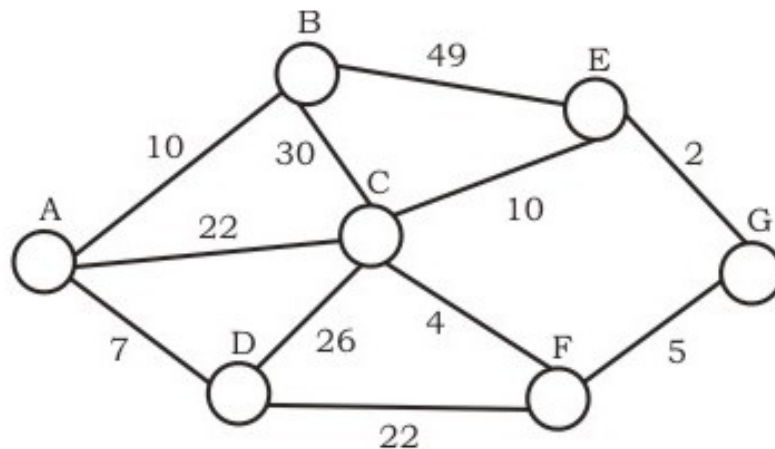
Or

Explain merge sort with example?

SECTION-C (2 x 20 = 40)

9. How can we solve the 0/1 knapsack problem using branch and bound. Solve the following problem, where capacity is W=5.

Item i	1	2	3	4
Value val	200	20	60	40
Weight wt	3	2	4	1

10. Find the minimum spanning tree of given graph through prims algorithm:

Or

Find the minimum spanning tree of given graph through kruskal's algorithm: