Roll No: ---------------------------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: **B. Tech (Mechatronics)** **Semester – Vth**

Subject (Course): Design and Analysis of Algorithms **Max. Marks : 100**
Course Code : CSEG 320 **Duration : 3 Hrs**
No. of page/s: 3

Section A (4 x 5 = 20)

Attempt all the questions. All question carries 5 marks.

1. Solve the recurrence: T(n)=2T(n/2) + n log n
2. Compute Big-Oh for following code:

```
void function(int n)
{
        int i = 1, s =1;
        while(s<=n)
        {
                i++;
                s = s + 1;
                printf("*");
        }
}
```

3. Find big oh (O) notations, big omega and theta notations for the following function:

   $f(n)=n^4+100n^2+50$

4. What do you mean by back tracking? Explain N queen problem with example.

Section B (4 x 10 = 40)

Attempt all the questions. All question carries 10 marks.

5. Write all the steps of Quick sort on the following array
   <2, 9, 67, 25, 34, 19, 7, 12, 15>
   Discuss the best case, worst case and average case for the quick sort algorithm. Write the recurrence for each case.
6. Given a sorted array in which all elements appear twice (one after one) and one element appears only once. Find that element in O (log n) complexity.

7. Design a state space tree for the sum of subset problem for the following:
S=<2, 5, 10, 15, 20> and M = 25.
Find a subset of set S, whose elements sum is equals to M.

8. Explain 0/1 knapsack problem and solve the 0/1 Knapsack problem for the 5 number of objects: (weights and benefits are given)

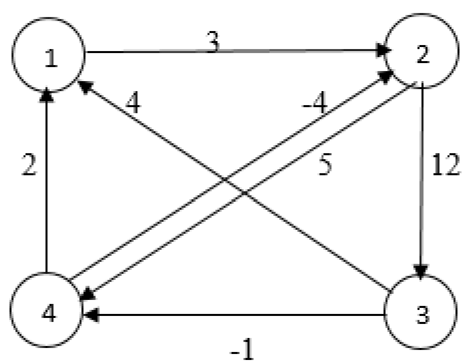
Maximum capacity of the knapsack W = 5

I	**1**	**2**	**3**	**4**
Wi	2	3	5	1
Bi	3	4	3	7

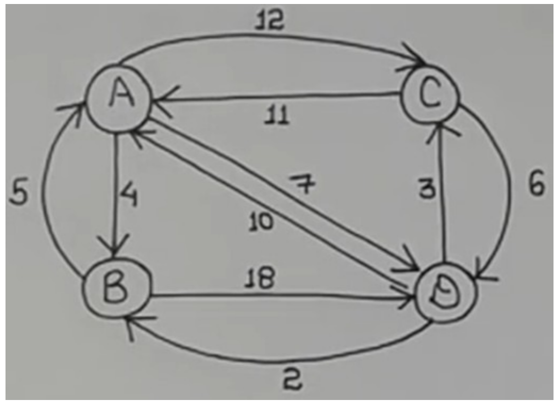
Section C (2 x 20 = 40)

Attempt all the questions. All question carries 20 marks.

9. What do you mean by All pair shortest path problem? Solve the all pair shortest path problem for the following graph:

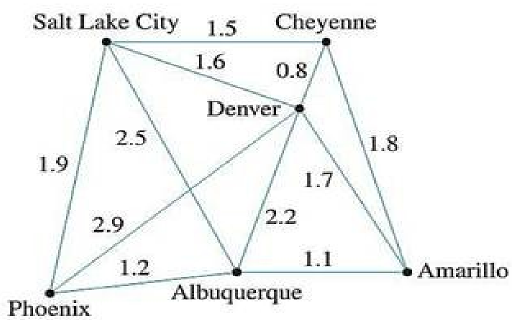


10. Explain branch and bound technique for solving the Travelling Salesman Problem for the following graph:



OR

What do you mean by Minimum Spanning Tree? Apply the Prim's Algorithm for the following distance map and compute Minimum Spanning Tree:



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Section A (4 x 5 = 20)

Attempt all the questions. All questions carry 5 marks.

1. Solve the recurrence: $T(n)=3T(n/2) + n^2$

2. Compute Big-Oh for following code:
```
void function(int n)
{
        int i = 1, count =0;
        for(i=1; i*i <= n ; i++)
                count++;
}
```

3. Given an array that represents elements of arithmetic progression in order. One element is missing in the progression, find the missing number.

4. Find big oh (O) notations, big omega and theta notations for the following function

$$F(x) = 3x^4 + 5x^3 + 2x^2 + x + 1$$

Section B (4 x 10 = 40)

Attempt all the questions. All questions carry 10 marks.

5. Write all the steps of Quick sort on the following array
<15, 12, 7, 19, 34, 25, 67, 9, 2>
Discuss the best case, worst case and average case for the quick sort algorithm. Write the recurrence for each case.

6. What do you mean by back tracking? What are the differences between back tracking and dynamic programming?

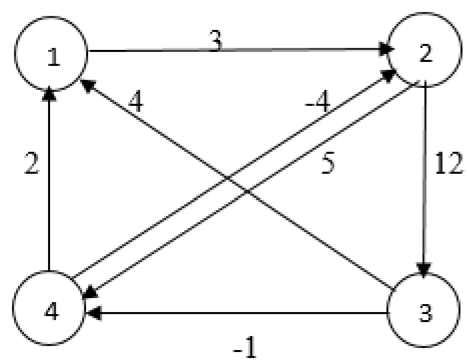
7. Design a state space tree for the sum of subset problem for the following set:
S = < 4, 1, 6, 5, 2, 7> and sum of subset M = 7.

8. Explain Strassen's matrix multiplication method with an example.

Section C (2 x 20 = 40)

Attempt all the questions. All questions carry 20 marks.

9. What do you mean by All pair shortest path problem? Solve the all pair shortest path problem for the following graph:



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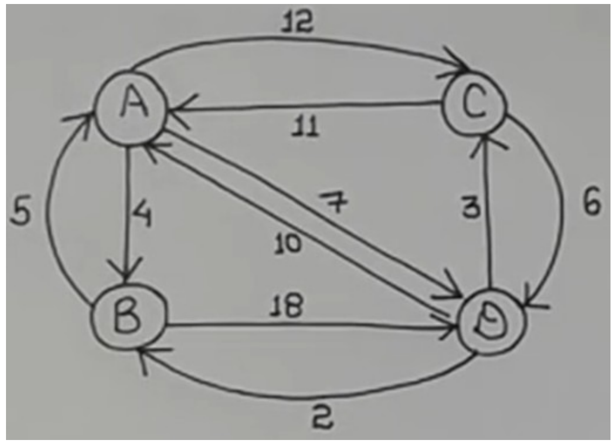

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