Roll No. _____

Thapar Institute of Engineering and Technology, Patiala

Computer Science & Engineering Department

BE (CoE) : Semester-4 (Aux Exam Mar-23) Course Code: UCS 415

Course Name: Design & Analysis of Algorithms

March 02, 2023 Thursday, 05.30PM

Time: 3 Hours, M. Marks: 100 Name of Faculty: Dr. Rajiv Kumar

Note : Attempt All questions. All parts of a Question should be done at one place. Assume any logical data with reasoning, if missing.

1 Given a chain of four matrices A_1, A_2, A_3, and A_4 with orders 4 x 10, 10 x 3, 3 x 12, 12 x 20 respectively. Find M[1, 4] and also write the order (Parentheses wise i.e. which two matrices should be multiplied first and so on.) in which the matrices should be multiplied 20

2 Solve the following traveling sales person problem with dynamic programming approach. The distances are given in miles in a 4 – city tour. Assume the start vertex as 1.

1	2	3	4
0	120	220	150
120	0	100	110
220	80	0	160
150	110	160	0

20

3 For a given set of non-negative integers {5, 10, 12, 13, 15, 18}, find all the subsets such that sum of elements of subset is equal to 30 by generating the state space tree representation. Also write the algorithm for subset sum problem using backtracking method. 20

4 a. Solve the Recurrence relation using recursive tree method:

$$T(n) = T\left(\frac{n}{3}\right) + T\left(\frac{2n}{3}\right) + cn$$ 20

b. Explain the difference between Backtracking and Branch & Bound algorithmic strategy.

5 a) A person proposes the following version of binary search:

```
bsearch ( L, i, j, key) {
 if(i>j)
     return -1
   k= ( i + j ) / 2
   if ( key = = L [ k ] )          return k
   if ( key  < L [ k ])
        return bsearch(L, i, k, key)
   else
        return bsearch(L, k +1, j, key)
}
```

Is this version correct? If yes, then what is the worst – case time?

b) What would be the order of the following loops

(i)
```
for i  = 1  to 2n step 2
   for j =  n  to 1 step -1
      x = x * (i * j ) / 2
```

(ii)
```
for i = n to 1
  { for j = 1 to i
      for k = 1 to j
          x = x * i * j
          i = i / 2
  }
```

(iii)
```
i = n
 while(i ≥ 0)
  {   for j = 1 to n / 2
          y = y + i /2
          i = i + 1
  }
```

10,10