Exam Date & Time: 24-Dec-2020 (10:00 AM - 01:45 PM)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY
Fifth Semester of B. Tech. (CE/CSE) Examination
December 2020

Design and Analysis of AlgorithmS [CE342]

Marks: 70 **Duration: 225 mins.**

MCQ

Answer all the questions.

Attempt All MCQ

1) Consider two strings A = "qpqrr" and B = "pqprqrp". Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B and let y be the number of such longest common subsequences between A and B. Then x + 10y = ___. (2)

1) 33 2) 34 3) 23 4) 43

2) Four matrices M1, M2, M3 and M4 of dimensions p x q, q x r, r x s and s x t respectively can be multiplied in several ways with different number of total scalar multiplications. For example, when multiplied as ((M1 X M2) X (M3 X M4)), the total number of multiplications is pqr + rst + prt. When multiplied as (((M1 X M2) X M3) X M4), the total number of scalar multiplications is pqr + prs + pst. If p = 10, q = 100, r = 20, s = 5 and t = 80, then the optimal number of scalar multiplications needed is (2)

1) 25000 2) 248000 3) 19000 4) 44000

3) Given a pattern of length- 5 window, find the spurious hit in the given text string.

Pattern: 3 1 4 1 5

Modulus: 13

Text: 2 3 5 9 0 2 3 1 4 1 5 2 6 7 3 9 9 2 1 3 9 (1)

1) 1 2) 2 3) 3 4) 4

4) What is the best case and worst-case complexity of ordered linear search? (1)

1) O(nlogn), O(logn) 2) O(logn), O(nlogn) 3) O(n), O 4) O, O(n)

5) Arrange the following function in ascending order of their growth?

$F1(n)=2^n$, $F2(n)=n^{3/2}$, $F3(n)=n\log_2 n$, $F4(n)=n^{\log_2 n}$ (1)

1) F3, F2, F4, F1 2) F3, F2, F1, F4 3) F2, F3, F1, F4 4) F2, F3, F4, F1

6) Kruskal's algorithm uses_____ and Prim's algorithm uses _____ in determining the MST. (1)

1) edge, vertex 2) vertex, edge 3) edges, edges 4) vertex, vertex

7) Which of the following sorting algorithms in its typical implementation gives the best performance when applied on an array that is sorted or almost sorted (maximum 1 or two elements are misplaced)? (1)

1) Quick Sort 2) Insertion Sort 3) Merge Sort 4) Heap Sort

8) You are given a knapsack that can carry a maximum weight of 60. There are 4 items with weights {20, 30, 40, 70} and values {70, 80, 90, 200}. What is the maximum value of the items you can carry using the knapsack? (2)

1) 160 2) 200 3) 170 4) 90

9) In dynamic programming, the technique of storing the previously calculated values is called _____. (1)

1) Saving value property 2) Storing value property 3) Memoization 4) Mapping

10) The difference between Divide and Conquer and Dynamic Programming is: (1)

1) Whether the subproblems overlap or not 2) The division of problems and combination of subproblems 3) The way we solve the base case 4) The depth of recurrence

11) Division Pattern of Problems in Divide and Conquer approach Select one: (1)

1) Iterative 2) Recursive Correct 3) Parallel 4) Random

12) Backtracking algorithm is implemented by constructing a tree of choices called as? (1)

1) State-space tree 2) State-chart tree 3) Node tree 4) Backtracking tree

13) You are given infinite coins of denominations 1, 3, 4. What is the total number of ways in which a sum of 7 can be achieved using these coins if the order of the coins is not important? (2)

1) 4 2) 3 3) 5 4) 6

14) NP-Complete ∩ P = _____which of the following is true? (2)

1) NP-Hard 2) ø 3) P 4) NP-Complete

15) The Highest Lower Bound on the number of Comparisons in the worst case for comparison-based sorting order of (1)

1) n 2) n^2 3) nlogn 4) n log2n

Section-1

Answer 5 out of 6 questions.

Do as Directed [Any five/

16) How to choose an algorithm for solving a single problem, when you have multiple algorithms for solving the same problem? Which from the below functions take less time to solve the given problem? Justify your answer: (5)

a). G(n)=2G(n-1) + 1

b). G(n)=G(n-1) + n

17) Apply Rabin-karp string matching algorithm to find out pattern 31415 in the text 2359023141526739921 to find valid match and spurious hits. Take value of q=13. Compare the result with, if we take value of q=11. (5)

18) Amar takes 2, 6 and 7 hours of time to perform cooking, gardening and cleaning respectively. Akbar takes 4, 8 and 3 hours of time to perform cooking, gardening and cleaning respectively. Anthony takes 9, 5 and 1 hours of time to perform cooking, gardening and cleaning respectively. Find out optimal job assignment for Amar, Akbar and Anthony. (5)

19) You are given two machine with capability to solve given problems (10^(-4)*(2^n) Seconds and (10^(-6)*(2^n) Seconds respectively. Show the calculation that proves which machine is better for input instance size n=10, 15, 20, 30 and 45. Instead of machine A if we choose to use machine C with capability (10^(-2)*(n^3) Seconds, what kind of significant improvement we may get. Show the complete detail analysis. (5)

20) Derive complexity for divide and conquer based matrix multiplication. Is there any approach by which we can reduce matrix multiplication complexity? If yes, then how? (5)

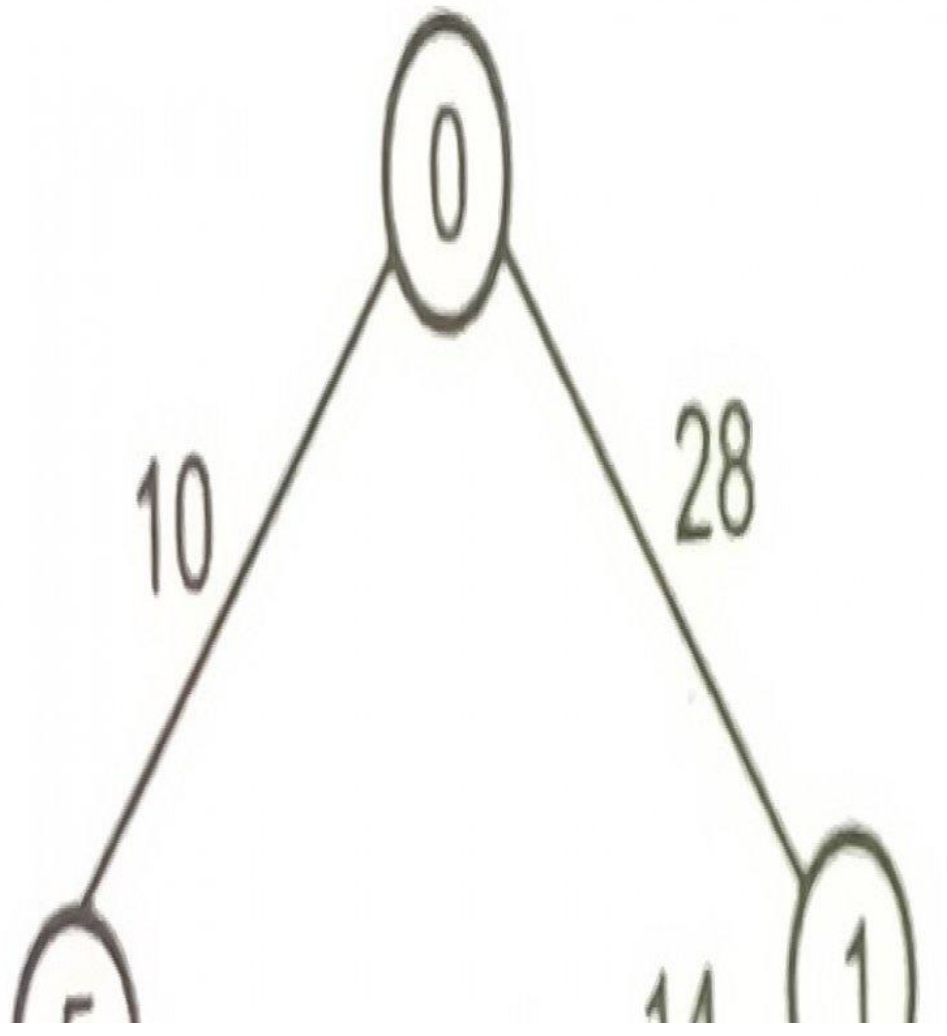
21) What do you mean by algorithm designing approach? Do Comparison of Backtrack, Branch bound and Dynamic programming. (5)

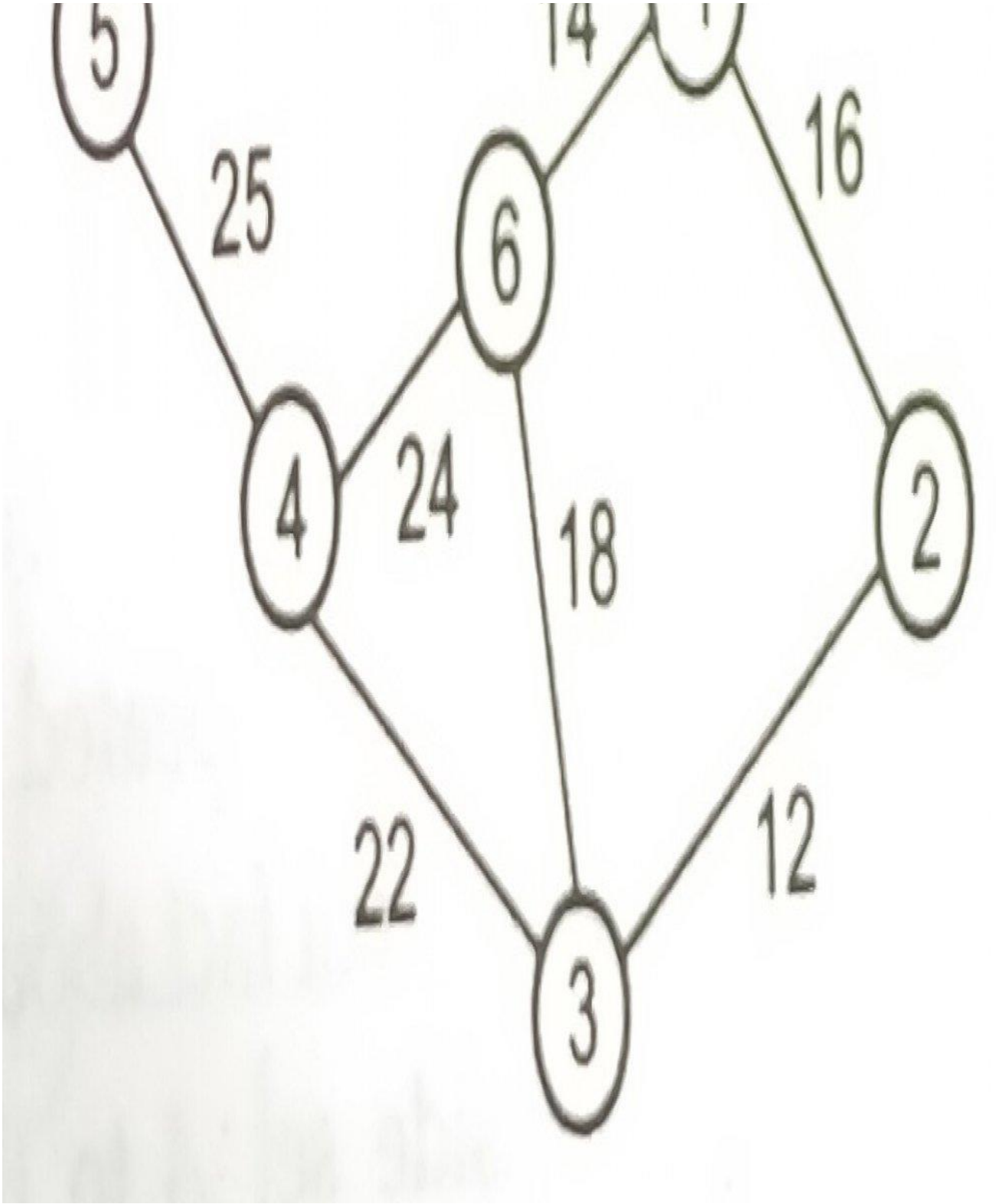
Section-2

Answer 5 out of 6 questions.

Do as Directed [Any five/

22) Generate minimum cost spanning tree for the following graph using Prim's Algorithm. (5)





23) State Master Theorem. Solve the following recurrence equations using Master Theorem:

a). $T(n) = 2T(n/2) + n \log n$

b). $T(n) = 3T(n/3) + \sqrt{n}$ (5)

24) Apply activity selection process of greedy approach to get maximum activities to be conducted for given activities (i) with start time (Si) and finish time (Fi). (5)

i	1	2	3	4	5	6	7	8	9	10	11

S_i	1	3	0	5	3	5	6	8	8	2	12
F_i	4	5	6	7	8	9	10	11	12	13	14

25) Write short note on following:

1. Polynomial Reduction
2. NP-Complete
3. NP-Hard

(5)

26) Find the binomial coefficient C(8,6) using dynamic programming. (5)

27) Derive time recurrence relation of Quick Sort in worst case and solve the recurrence by iterative method. (5)

-----End-----