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C033531(033)

B. Tech. (Fifth Semester) Examination, Nov.-Dec. 2021

AICTE (~~New~~ Scheme)

(IT Engg. Branch)

DESIGN and ANALYSIS of ALGORITHMS

(Information & Technology)

(BT3033)

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) carries 4 marks and is compulsory. Attempt any* ***two*** *parts from (b), (c) and (d) carrying 8 marks each.*

1. (a) Calculate time complexity in Big O notation for the following code :

for $(i = 1 ; i <= n ; i++)$

for $(j = 1 ; j <= n ; j++)$

$C[i, j] = 0 ;$

for $(k = 1 ; k <= n ; k++)$

$C[i, j] = C[i, j] + A[i, k] * B[k, j]$ 4

(b) Solve the recurrence relation

$T(n) = T(n-1) + \log(n)$

by substitution method and tree method. 8

(c) State the master theorem and use the master theorem to give the tight asymptotic bounds for the following recurrences :

(i) $T(n) = 8T(n/2) + n$

(ii) $T(n) = T(n/2) + n^2$ 8

(d) What is Asymptotic notation? Explain big oh(O), Big omega (Ω) and big theta (θ) notations. 8

2. (a) Explain Divide and Conquer approach with example. 4

(b) Write Merge sort algorithm and explain Merge sort time complexity analysis with example. 8

(c) Write the Quick Sort algorithm. And apply it to sort (take the left most element as Pivot element).

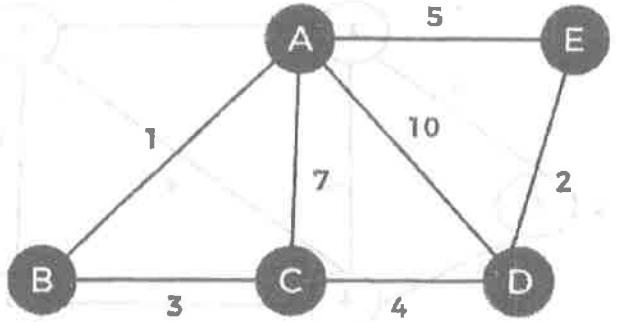
44 33 11 55 77 90 40 60 99 22 88 8

(d) Apply Binary search algorithm to sort elements :

2, 5, 8, 12, 16, 23, 38, 56, 72, 91 Give time complexity analysis with advantages and dis-advantages of Binary search algorithm. 8

3. (a) What is a Greedy Algorithm? Write characteristics of the Greedy Algorithm. 4

(b) Write and analyse Kruskal's Algorithm for finding minimum spanning tree and for the given undirected graph. 8



(c) Given the sequence { 4, 10, 3, 12, 20 and 7 }. The matrices have size 4×10, 10×3, 3×12, 12×20, 20×7. Compute $M[i, j]$, $0 \le i, j \le 5$. 8

(d) Find the optimal solution for the fractional knapsack problem making use of greedy approach. Consider :

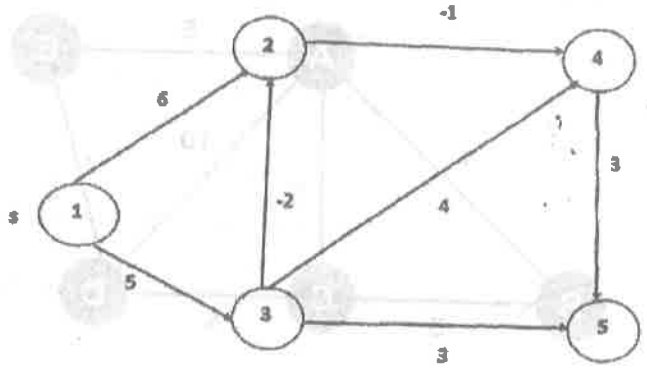
$n = 4$, $m = 6$ kg

$(w1, w2, w3, w4) = (3, 2, 10, 2)$

$(p1, p2, p3, p4) = (15, 20, 30, 14)$ 8

4. (a) Explain Topological sorting of nodes of an acyclic graph and what are its applications. 4

(b) Find shortest path in the given weighted graph using Bellman Ford algorithm from 1 to 5. 8



(c) Explain Breadth First Search Algorithm with example. 8

(d) Expain Travelling salesman problem with example. 8

5. (a) Explain backtracking. What are its applications? 4

(b) Define the term P class, NP class, NP hardness and NP-completeness with example. 8

(c) Explain 4 Queen problem and solve it by using back-tracking technique. 8

(d) Explain KMP string matching algorithm with an example. 8