Total No. of printed pages = 3

CSE 181502

Roll No. of candidate

21/2/22 2021

B.Tech. 5th Semester (R) End-Term Examination

CSE

DESIGN AND ANALYSIS OF ALGORITHM

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Q.No. 1 and any *four* questions from the rest.

1. Answer the following : $(10 \times 1 = 10)$

(a) What are P and NP class problems?

(b) State Master's Theorem.

(c) What are randomized algorithms?

(d) What are the different algorithm strategies?

(e) What is amortized analysis?

(f) What is a Minimum spanning tree?

(g) What is a Network Flow? Give some algorithms to solve it.

(h) What will the number of comparisons needed to simultaneously find minimum and maximum.

(i) State Ω - notation.

(j) What are the different approaches to solve Knap Sack problem using greedy method?

2. (a) What is dynamic programming? What are the various steps involved in the solution of a dynamic programming problem? $(1 + 2 = 3)$

(b) With working modulo q = 11, how many spurious hits does the Rabin Karp algorithm encounters in the text, T = 314152692 when looking for the pattern, P = 26. (8)

(c) Differentiate between comparison sort and non-comparison sort. (4)

[Turn over

3. (a) State the Cook's theorem. (2)

(b) Insert the following keys in a red black tree and a Binomial heap and show the steps of construction too. (7 + 6 = 13)

14, 17, 11, 7, 53, 4, 13, 12, 8, 60, 19, 16, 20

4. (a) Create a Fibonacci heap from the following keys : H, I, J, B, A, E, C, F, D, G, K, L. (5)

(b) What are the different operations on heaps and their complexities too? (4)

(c) Sort the following keys using counting sort :

3, 6, 4, 1, 3, 4, 1, 4 (6)

5. (a) Solve the following recurrences : (2 + 2 + 3 = 7)

(i) $T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$. (Master Theorem)

(ii) $T(n) = 2T\left(\sqrt{n}\right)$. (Changing variable)

(iii) $T(n) = 2T(n/2) + \sqrt{n}$. (Recursion tree)

(b) Show that Master's Theorem cannot be applied on the following recurrence :

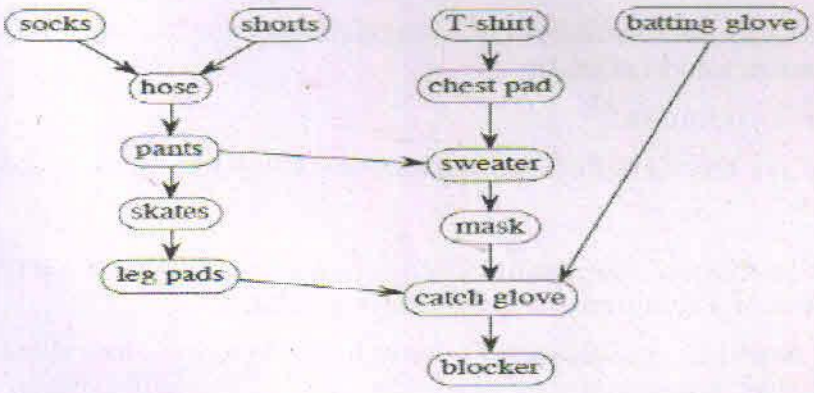
$T(n) = 4T(n/2) + n^2 \log n$.

Give the solution of the above recurrence too. (3 + 5 = 8)

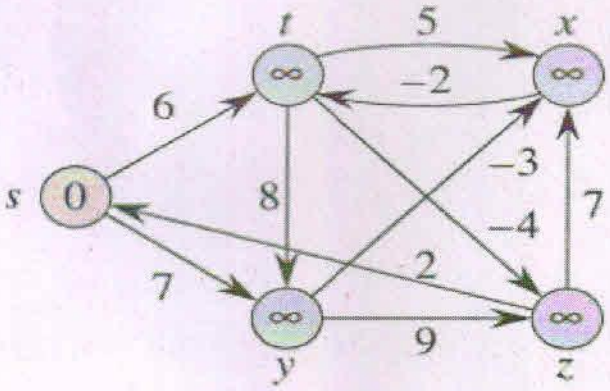
6. (a) Given a sequence of matrices, a = 10 × 100, b = 100 × 20, c = 20 × 5 and d = 5 × 80. Insert parenthesis so that the product of the matrices, in order, is unambiguous and needs the minimal number of multiplication. (7)

(b) Write the algorithm for Q.No. 6 (a). (3)

(c) Give a linear ordering for the vertices of the graph and write the algorithm too. (5)



7. (a) Solve the single - source shortest path problem in the given graph from the source vertex. (8)



(b) Write the algorithm for Q.No.7 (a) and find its complexity too. (4)

(c) Differentiate between Breadth First Search (BFS) and Depth First Search (DFS). (3)