

Roll Number:

Thapar University Patiala

Department of Computer Science & Engineering

BE-CS (5th Semester) EST Dec 2012

UCS-501: Algorithm Analysis and Design

Time: 03 Hours; MM: 40

Name of Faculty: Dr Deepak Garg, Dr Shivani Goel

Note: Attempt all questions. All subparts should be together.

1	(a) Prove the complexity of the following expressions and find out n_0 (i) $20n^2 + 17n + 9 : \theta(n^2)$ (ii) $3n^3 + 20n^2 + 5 : \Omega(n^3)$ (b) Explain and prove how the complexity of quick sort varies with the selection of pivot element? (c) Define and explain with example: Vertex cover, Regular graph, Peterson graph, Independent set.	2 2 4																																				
2	(a) Write an efficient program to find whether a given Graph is Bipartite or not. (b) Find the minimum distance path using branch and bound for Traveling Salesman Problem given <table border="1"><tbody><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr><tr><td>A</td><td>∞</td><td>20</td><td>30</td><td>10</td><td>11</td></tr><tr><td>B</td><td>15</td><td>∞</td><td>16</td><td>4</td><td>2</td></tr><tr><td>C</td><td>3</td><td>5</td><td>∞</td><td>2</td><td>4</td></tr><tr><td>D</td><td>19</td><td>6</td><td>18</td><td>∞</td><td>3</td></tr><tr><td>E</td><td>16</td><td>4</td><td>7</td><td>16</td><td>∞</td></tr></tbody></table>		A	B	C	D	E	A	∞	20	30	10	11	B	15	∞	16	4	2	C	3	5	∞	2	4	D	19	6	18	∞	3	E	16	4	7	16	∞	4 4
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3	(a) We can sort any given 7 numbers with 10 comparisons. Do you agree? Justify your answer. (b) Discuss matrix chain multiplication using dynamic programming with an example of five matrices $3 \times 7, 7 \times 6, 6 \times 9, 9 \times 2, 2 \times 5$. State the complexity . (c) Write An efficient Algorithm for the Matrix Multiplication Problem. It should print final parenthesization of the given chain of matrices.	2 2 4																																				
4	(a) Write an efficient algorithm for Boyer Moore's algorithm for pattern matching in strings. Show step by step execution of this algorithm for matching pattern "man" in the string "I am a machoman". What is the complexity of the algorithm? (b) Professor Day is interested in studying extreme temperatures on the Arctic Cap. He placed temperature-measuring devices at m locations, and programmed each of these devices to record the temperature of the corresponding location at noon of every day, for a period of n days. Moreover, using techniques that he learned while preparing the Heapsort lecture, he decided to program each device to store the recorded temperatures in a max-heap. To cut a long story short, Prof. Day now has m devices that he collected from the Arctic Cap, each of which contains in its hard-drive a max-heap of n elements. He now wants to compute the k largest temperatures that were recorded by any device, e.g., if $m = 2, n = 5, k = 5$, and the two devices recorded temperatures $(-10; -20; -5; -34; -7)$ and $(-13; -19; -2; -3; -4)$ respectively, the desired output would be $(-2; -3; -4; -5; -7)$. Write the Algorithm how he can find the k largest elements in $O(m + k \log k)$ time?	4 4																																				
5	Write note on the following: (a) $P=NP$ or $P \neq NP$ (b) Approximation algorithms (c) Knapsack problems and its versions (d) Huffman compression (e) Crossover Operator in Genetic Algorithm (f) Parallelism of work in a program for Parallel Programming (g) Difference Between Dynamic and Greedy Programming (h) Difference Between Adaptive and Non Adaptive Sorting with example	8																																				