



NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI
END SEMESTER EXAMINATION - JAN. 2020 SESSION

DEPARTMENT : Computer Science and Engineering
DATE & TIME OF EXAM : 17-05-2021 & 10AM
SUB CODE : CSPE43 DURATION:120mins
FACULTY NAME :Dr.B.Nithya

Note to Student:

- 1. Make sure the 'Declaration and statement of authorship' is uploaded along with the answer sheet as cover sheet (First Sheet)**
- 2. TIME MANAGEMENT IS YOUR RESPONSIBILITY**

Instructions:

1. Answer ALL Questions. Each question carries 3 marks.
2. Write your Name, Roll No. and Page No. in all the sheets.
3. Maximum duration is 120 Min. Extra 30 Min is **ONLY** for uploading your answer sheets (as a PDF file) in the portal.
4. Answer sheets should be sent through portal and **NOT** in any other way.
5. While answering, clearly give your assumptions (if any) and examples.

Input String:

1. Create the input string of length 15 from your name as given in the name list (shared through WhatsApp).
2. If your name has less number of characters, repeat your name to match the required length. If length exceeds 15, consider only the first 15 characters.
3. No spaces and special characters are considered between the characters. No case sensitive.



NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI
END SEMESTER EXAMINATION - JAN. 2020 SESSION

4. Questions 5, 6 and 10 consider the first 10 characters and for 7th question, only first 6 characters are used. For the rest of the questions, the entire string of length 15 is used.
5. The place value of characters are obtained as: A - 1, B - 2, C - 3, D - 4, . . . , X -24 , Y - 25, Z - 26. This is only for 7th and 10th questions. For the rest of the questions, characters should be used.
6. **Example 1:** For the name *DIVAKAR P S*, the corresponding input string is *DIVAKARPSDIVAKA*
Example 2: For the name *MALLENIPALLI GOUTHAM SIDDHARTH*, the corresponding input string is *MALLENIPALLIGOU*

Expected Way of Answering

1. **Strictly** you have to follow the methods/procedures/algorithms which we had in the class. (including the variable name, cases, etc.,)
2. Though the answer is **correct** by using any other methods/procedures/algorithms, marks will **not** be given.
3. If the answers have diagrams with **minimum/no** proper instructions, marks will **not** be awarded.



NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI
END SEMESTER EXAMINATION - JAN. 2020 SESSION

1. Construct the binomial heap with the characters in the input string. From the resultant heap, delete the 5th, 10th and 15th character.
2. Construct the Fibonacci heap with the characters in the input string. From the resultant heap, delete the 5th, 10th and 15th character.
3. Construct the B+ tree of order 3 with the characters in the input string. From the resultant tree, delete the 5th, 10th and 15th character.
4. Construct the splay tree for the characters in the input string. From the resultant tree, delete the 5th, 10th and 15th character using bottom up splaying approach.
5. Construct the max Segment tree with the first 10 characters of the input string and perform the following operation with lazy propagation
 - i. range update [5,10] by 3,
 - ii. range update [5,5] by 2
 - iii. max [3,5]
6. Using DP, construct optimal BST with the first 10 characters of the input string. Find the probabilities p_i and q_i using the following equation. The total probability may or may not be 1. Also assume that $Q_0 = 0.2$.
$$P_i = 1/\text{place value of character}; \quad Q_i = 1 - P_i$$

Ex: if the character is m then $P_i = 1/13 = 0.077$ (3 decimal digits with round off) and $Q_i = 1 - 0.077 = 0.923$
7. Consider a knapsack of maximum capacity with 20 and 6 items (first 6 characters from the input string) need to be put into the knapsack. The weights are the corresponding place values and profits are 10times the weights. Find the maximum profit using LC branch and bound method.



NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI
END SEMESTER EXAMINATION - JAN. 2020 SESSION

Ex:

Items	a	B	c	d	E	F
Weight	1	2	3	4	5	6
Profit	10	20	30	40	50	60

8. Apply KMP algorithm to find all the occurrences of pattern in the input string. Pattern of length 7 is constructed as follows: 1st character in the string is repeated for 2 times, 2nd character by 1 time, 1st character by 2 times, 2nd character by 1 time, and 1st character by 1 time.

Ex: String of length 15: *algorithmalgori*

Pattern of length 7: *aalaala*

9. Find the occurrences of pattern (as given in 8th question), in your input string using Boyer Moore string matching algorithm.

10. Illustrate the procedure to find the convex hull for the following data points which are obtained as follows:

Consider the first 10 characters of the input string. x and y coordinate values of a point is obtained by the two adjacent characters.

Ex: If input string is *convexhull*, then the data points are (3,15), (15,14), (14,22), (22,5), (5,24), (24,8)(8,21)(21,12)(12,12)