B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E.   Semester: V
Branch: Information Science and Engineering   Duration: 3 hrs.
Course Code: 20IS5PEADS   Max Marks: 100
Course: Advanced Data Structures and Algorithms   Date: 03.03.2023
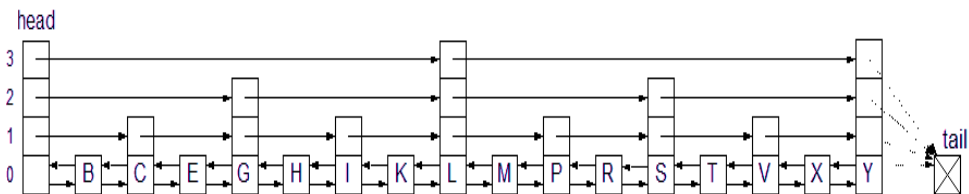
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
              2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Identify the keys which constitutes as internal nodes after creating a B-tree of **09**
      order M=4 for the given set of keys:- C, S, D, T, A, W, G, I, M, N, P, B, Also
      show the tree after deletion of key "P" & "M".

   b) What are the applications of suffix tree? **05**

   c) Define a skip list. Illustrate of how the following skip list would be after: **06**

   i) Insertion of U to the original list
   ii) Deletion of S (after the insertion of U).
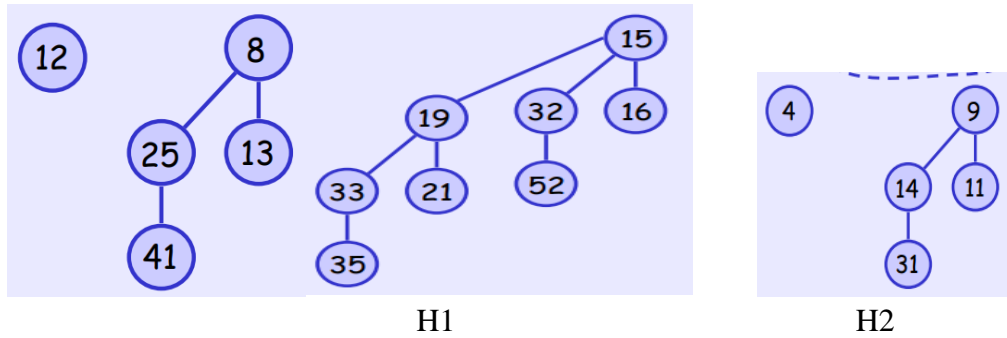
OR

2 a) Explain the properties of B- tree with a suitable example. **05**

   b) Construct a standard and compressed Trie implemented with List Nodes for **08**
      the Strings {FOLLOWS, FOLLOWING, FOLLOWED, CAT, CONCAT}.

   c) With an example, describe the primary task performed by a segment tree. **07**
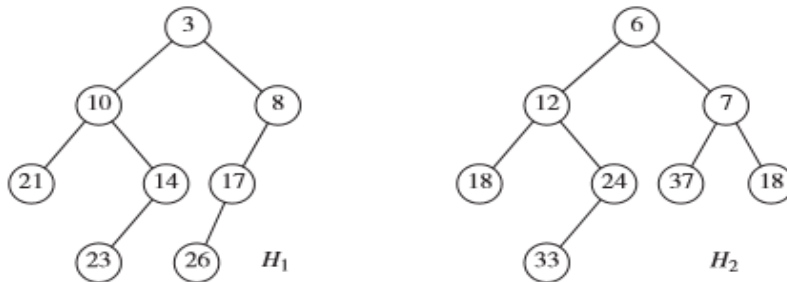   What is the time and space requirement for the construction of a segment tree?

UNIT - II

3 a) Compare Binomial Heap and Fibonacci Heap with respect to their structure **06**
      and heap operations.

b) What are the properties of binomial heaps? Demonstrate merge operations for H1 and H2. **07**

H1   H2

c) Illustrate the result of merging H1 and H2 leftist heaps given below. **07**

H_1 H_2

UNIT - III

4 a) Discuss the greedy algorithm for the activity selection problem. Apply the same for the following problem instance. **07**

Start time	1	3	0	5	3	5	6	8	8	2	12
finish time	4	5	6	7	9	9	10	11	12	14	16
Activity name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11

b) Construct a Huffman tree for the following occurrence probabilities. **06**

Characters	a	b	c	d	e	f
Probabilities	0.45	0.13	0.12	0.16	0.09	0.05

c) Calculate the Longest Common Subsequence for the strings **'abcda'** and **'acbdea'** using dynamic programming approach. **07**

OR

5 a) Compute the solution to matrix chain multiplication problem using dynamic programming for the matrix dimension sequence: {4, 10, 3, 12, 20,7} **10**

b) Construct an optimal binary search tree for the given set of keys and its respective probability values using dynamic programming. **10**
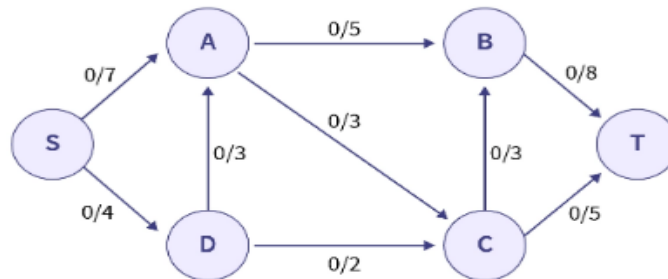
Key	A	B	C	D
Probability	0.1	0.2	0.4	0.3

UNIT - IV

6 a) Write the pseudo-code Knuth-Morris Pratt (KMP) string matcher. Compute **10**
the prefix function for the pattern "**ababaca**" and find the pattern in the text
"**aababcabcababaca**".

   b) Using the Rabin-Karp string matching algorithm, how many spurious hits are **06**
encountered while finding the occurrence of the pattern P = 31415 in the text
T = 2359023141526739921 with working modulo q = 13.

   c) Design the state transition table for the pattern "**ababb**" to be searched in any **04**
given text.

UNIT - V

7 a) Apply extended Euclid's algorithm to find two integers such a and b such that **06**
21a+9b= GCD (21,9).

   b) Apply Ford Fulkerson algorithm to compute the maximum network flow for **07**
the graph shown below –

   c) Apply Bellman Ford Algorithm for the graph below, considering 'S' as the **07**
source vertex.

******