

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2022

B.Tech-II Semester (CS/IT/ECE/Civil/BT)

COURSE CODE (CREDITS): 18B11CI211(4)

MAX. MARKS: 35

COURSE NAME: Data Structure and Algorithms

MAX. TIME: 2 Hours

COURSE INSTRUCTORS: Dr. P.K. Gupta, Dr. Ravindara Bhatt, Dr. Amol Vasudeva, Dr. Ekta Gandotra, Dr. Nishant Jain, Dr. Harsh Sohal

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

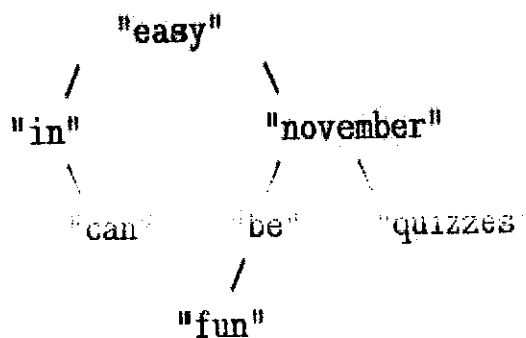
Q1. Suppose that executing an algorithm on input of size N requires executing $T(N) = 8N + \log N$ instructions. How long would it take to execute this algorithm on hardware capable of carrying out 2^{28} instructions per second if $N = 2^{40}$? (Give your answer in hours, minutes and seconds, to the nearest second.) [3]

Q2. Draw a binary tree that has a pre-order and in-order traversal of A, B, C, D, E. Justify your answer. [3]

Q3. Give a sequence of exactly five push and pop operations such that: [3]
- The elements are pushed onto the stack in the following order: A, B, C, D, E.
- Elements are popped from the stack in the following order: B, D, E, C, A.

Q4. Write an algorithm that detects a loop in a given singly linked list. [3]

Q5. Consider the following binary tree: [3]



- What is the order of nodes visited in a pre-order traversal?
- What is the order of nodes visited in a post-order traversal?

Q7. Show the steps required to do a radix sort on the following set of values when using base 10. **346, 22, 31 212 157 102 568 435 8 14 5** [4]

0	1	2	3	4	5	6	7	8	9

0	1	2	3	4	5	6	7	8	9

0	1	2	3	4	5	6	7	8	9

Q6. Draw all binary search trees of height 2 that can be made from all the letters ABCDEF, assuming the natural ordering. [4]

Q8. Show the AVL tree that results after each of the integer keys **9, 27, 50, 15, 2, 21, and 36** are inserted, in that order, into an initially empty AVL tree. Clearly show the tree that results after each insertion, and make clear any rotations that must be performed. Now, perform **Delete(2)** key operation on the finally obtained AVL tree and rebalance it (*if required*). [4+2]

Q9. Draw the binary min-heap that results from inserting **4, 9, 3, 7, 2, 5, 8, 6** in that order into an initially empty binary heap. Also, draw the result of 2 deletemins call on your obtained heap. [4+2]