

(Following Paper ID and Roll No. to be filled in your  
Answer Books)

**Paper ID : 131405**

Roll No. 

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**B.TECH.**

**Theory Examination (Semester-IV) 2015-16**

**DATA STRUCTURE**

*Time : 3 Hours*

*Max. Marks : 100*

**Section-A**

**Q1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)**

- (a) What is an abstract data type? Is time and space complexity considered in defining ADT?
- (b) Perform evaluation of postfix expression using stack:  $ABC + *DE / -$ , where

$A=5, B=6, C=2, D=12, E=4$

- (c) How does linked list differ from an array?
- (d) At most, how many comparisons are required to search an element from a sorted vector of 1023 elements using the binary search algorithm ?
- (e) Demonstrate how will you represent the following sparse matrix having integer values ?

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 9 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 \end{bmatrix}$$

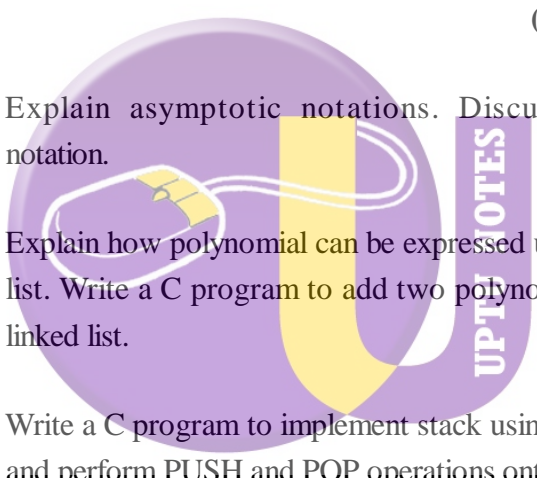
- (f) Generate a binary search tree for the list - 53, 65, 86, 78, 5, 25, 34, 29
- (g) How will be the elements having same priority accessed from a priority queue?
- (h) How many pointers are contained as data members in the nodes of a circular doubly linked list of integers with five nodes?
- (i) Draw a directed weighted (assume random weights) graph having 5 vertices and each node having degree 4.

- (j) A certain sorting algorithm is applied to the following data set 45,1,27,36,54,90. After two passes the re-arrangement of the data is 1, 27, 45, 36, 54, 90. Identify the sorting algorithm that was applied ? Justify the answer.

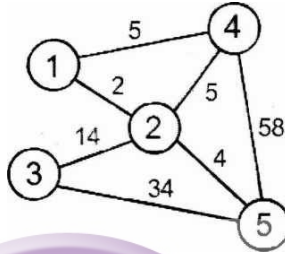
### Section-B

**Q2. Attempt any five questions from this section.**

**(10×5= 50)**

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- A large, stylized logo for UPTUNOTES. It features a purple circle with a yellow vertical bar and a white outline of a book or document. The text 'UPTUNOTES' is written vertically in white on the right side of the circle.
- (a) Explain asymptotic notations. Discuss Big(O) notation.
- (b) Explain how polynomial can be expressed using linked list. Write a C program to add two polynomials using linked list.
- (c) Write a C program to implement stack using linked list and perform PUSH and POP operations onto the stack.
- (d) Explain the concept of circular queue. Discuss the base cases to be verified for carrying our insertion and deletion operations in a circular queue.

- (e) Find out degree of each node for a graph given below. Apply BFS algorithm and obtain the graph node traversal sequence, considering start node of the BFS traversal as Node 1.



- (f) What is tail recursion? Write a C program using recursive function that solves tower of Hanoi problem.
- (g) Draw Huffman tree and generate Huffman code for the following symbols whose frequency of occurrence in a message is stated along with symbols given below : Also estimate the total number of memory bits saved using the Huffman coding scheme.

A:15 B:16 C:17 D:12 E:25 F:4 G:6 H:1 I:15

- (h) (a) Write a C program to search an element in array using binary search technique.

- (b) Perform two way merge sort operation on the array given-

24	7	46	41	85	4	94	14
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### Section-C

**Note: Attempt any two questions from this section.**

**(15×2=30)**

- Q3. (a) What is the importance of Garbage Collection?
- (b) Write an algorithm to delete and insert elements in DEQUE.
- (c) Write an algorithm to delete last element from a doubly linked list.
- Q4. (a) Sort 20, 35, 40, 100, 3, 10, 15 using selection sort.
- (b) Explain with an example to find minimum cost spanning tree using Kruskal algorithm.

- Q5. (a) Generate a binary tree for the following traversal sequences given -

IN-ORDER : B F G H P R S T W Y Z

PRE-ORDER : P F B H G S R Y T W Z

- (b) Write an algorithm to convert an infix expression into postfix form.

