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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
END SEMESTER EXAMINATION-2015

B.Tech II Semester

COURSE CODE: 10B11CI211 MAX. MARKS: 45
COURSE NAME: Data Structures
COURSE CREDITS: 04 MAX. TIME: 3 HRS

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Section A: Short answer questions **(Marks: 9)**

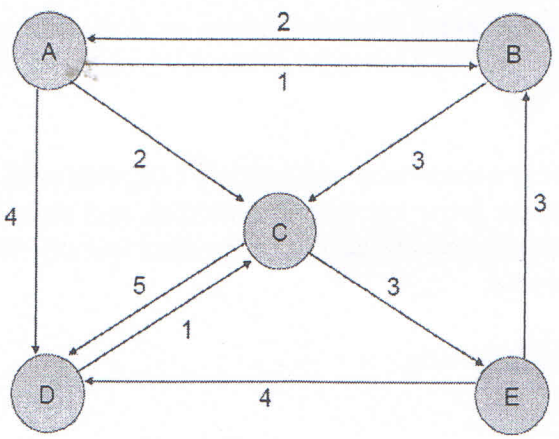
Q 1. Answer the following briefly and to the point (30 – 40 words only).

(1) What is the data structures used to perform simulation experiments?
(2) What are the disadvantages array implementations of linked list?
(3) What is meant by space complexity?
(4) What are the two classes of collision resolution techniques?
(5) What is a spanning tree?
(6) How can a graph be converted into an adjacency matrix?
(7) Give any three applications of graphs?
(8) Justify with example that "A tree having 'm' nodes has exactly (m–1) edges or branches".
(9) What are the various methods to build a hashing function?

Section B: Analytical Based Questions **(Marks: 4.5 * 3 = 13.5)**

Q 2.

(a) Given the graph below, solve the single-source shortest path problem (source = A) using Dijkstra's algorithm. Show each and every step of the algorithm:



(b) Suppose we have directed graph in the above figure, with weights that can be either positive or negative. Will Prim's algorithm produce a MST for such a graph?

Q 3.

(a) The following values are to be stored in a hash table:
25, 42, 96, 101, 102, 162, 197
Describe how the values are hashed by using division method of hashing with a table size of 7. Use chaining as the method of collision resolution.

(b) Two Binary Trees are similar if they are both empty or if they are both nonempty and left and right sub trees are similar. Write an algorithm to determine if two Binary Trees are similar.

Q 4.

(a) Write a short note on Depth-first algorithm.

(b) Explain how to implement two stacks in one array A[1..n] in such a way that neither stack overflows unless the total number of elements in both stacks together is n. The PUSH and POP operations should run in O(1) time.

Section C: Concept based Questions **(4.5 * 5 = 22.5 marks)**

Q 5. Consider the following array:

6 47 35 10 90 82 31

Sort the above using the following methods, thereby showing each step:

(a) Quick Sort

(b) Insertion sort

Q 6. Write an algorithm to implement the Josephus problem using a suitable data structure of your choice. Specify assumptions made if any.

Q 7.

(a) How do you rotate a AVL Tree? Explain right and left rotations with the help of an example.

(b)) Insert the following sequence of elements into an AVL tree, starting with an empty tree: 10, 20, 15, 25, 30, 16, 18, 19. Delete 30 in the AVL tree that you got.

Q 8.

(a) How will you represent a max-heap sequentially? Explain with an example.

(b) Devise a representation for a list where insertions and deletions can be made at either end. Such a structure is called *Deque* (Double ended queue). Write functions for inserting and deleting at either end.

Q 9. Write short notes on the following:

(a) B-tree

(b) Abstract data type

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