

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination November 2018

B. Tech in Computer Science Engineering, Semester III

Roll No.....

CSE301: DATA STRUCTURES

Time: 3 hours

Max. Marks: 80

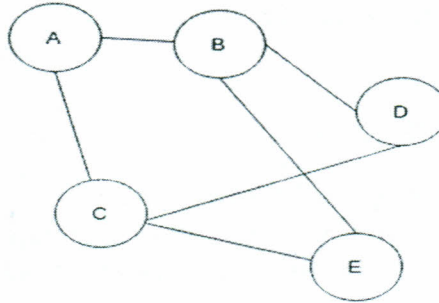
Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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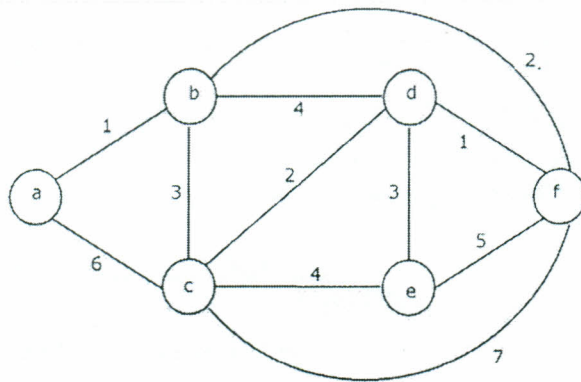
Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

i. For the given graph (G), which of the following statements is true?



- a) G is a complete graph
 - b) G is not a connected graph
 - c) The vertex connectivity of the graph is 2
 - d) The edge connectivity of the graph is 1
- ii. If the given input array is sorted or nearly sorted, which of the following algorithm gives the best performance?
- a) Insertion sort
 - b) Merge sort
 - c) Quick sort
 - d) Selection sort
- iii. While insertion in a sparse index, we assume that index stores an entry for each
- a) Block
 - b) Pointer
 - c) Position
 - d) Index
- iv. In Depth First Search, how many times a node is visited?
- a) Once
 - b) Twice
 - c) Equivalent to number of in-degree of the node
 - d) None of the mentioned
- v. Consider the following graph:



Which one of the following cannot be the sequence of edges added, in that order, to a minimum spanning tree using Kruskal's algorithm?

- a) $(a-b), (d-f), (b-f), (d-c), (d-e)$
- b) $(d-f), (a-b), (b-f), (d-e), (d-c)$
- c) $(d-f), (a-b), (d-c), (b-f), (d-e)$
- d) $(a-b), (d-f), (d-c), (b-f), (d-e)$

vi. Let G be a connected planar graph with 10 vertices. If the number of edges on each face is three, then the number of edges in G is _____.

- a) 24
- b) 20
- c) 32
- d) 64

vii. Dijkstra's algorithm :

- a) Has greedy approach to find all shortest paths
- b) Has both greedy and Dynamic approach to find all shortest paths
- c) Has greedy approach to compute single source shortest paths to all other vertices
- d) Has both greedy and dynamic approach to compute single source shortest paths to all other vertices.

viii. A person wants to visit some places. He starts from a vertex and then wants to visit every place connected to this vertex and so on. What algorithm he should use?

- a) Depth First Search
- b) Breadth First Search
- c) Trim's algorithm
- d) None of the mentioned

ix. What can be the techniques to avoid collision?

- a) Make the hash function appear random
- b) Use the chaining method
- c) Use uniform hashing
- d) All of the mentioned

x. Which of the following is a stable sorting algorithm?

- a) Merge sort
- b) Typical in-place quick sort
- c) Heap sort
- d) Selection sort

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- i. How is a general tree transformed to a binary tree?
- ii. How many edges are there in a graph with 14 vertices each of degree 8?
- iii. Define (i) Simple Graph (ii) Regular graph (iii) Planar Graph
- iv. What do you mean by hashing? Explain any five popular hash functions.

Q.3A Write an algorithm for insertion sort. Sort the following list by Insertion sort algorithm. 05

67, 55, 21, 18, 64, 10, 84, 92, 23, 16, 31

Also mention the complexity of insertion sort?

Q.3B Using double hashing insert the keys 05

$k = 11, 43, 16, 10, 21, 18, 26, 35, 19, 27$ in to the table where hash function is -

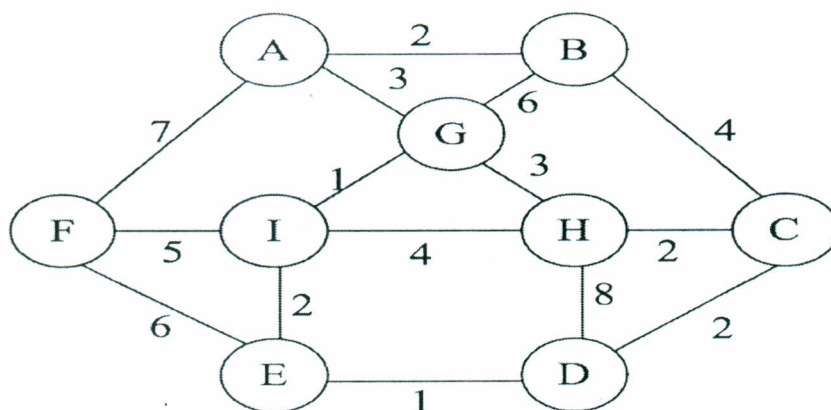
$H_i(k) = (h(k) + i(k \% 11 + 1)) \% 20$ where $h(K) = K \bmod 20$.

Resolve collision using linear probing.

Q.4 There are 10 robbers named as 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J' they stole 05
some coins from a bank and they decided to divide these coins equally among themselves. So they divide the coins into 10 parts but the last robber 'J' got 1 coin less than other robbers. So the remaining 9 robbers murder 'J'. They again decided to divide the coins into 9 parts. But this time again the last robber 'I' got 1 less coin than other robbers. So again the remaining 8 robbers murder 'I' and try to divide all coins in between remaining 8 robbers. But again this time 'H' got one less coin than the other. Now, this process goes on until 1 robber left i.e. is 'A'. After that 'A' take all the coins and run away. Now you have to Find out the total number of coins?

Q.5A Write an algorithm to test whether a Binary Tree is a Binary Search Tree. 05

Q.5B Execute Prim's and Kruskal algorithm to find the minimum spanning tree of the 05
following graph. Also mention the total cost of MST?



Q.6A Draw the graph represented by the following adjacency matrix. 10

	a	b	c	d	e	f	g
a		7	4				
b			5	3			
c				1			
d		1			2	2	5
e		1					
f			4	1			2
g					1		

1). Draw the adjacency list representation for this graph.

II). What is the sequence of vertices visited when we perform depth-first search from a?

III). What is the sequence of vertices visited when we perform breadth-first search from a?

Q.6B Suppose the following list of numbers is inserted in order into an empty AVL tree: 05

43, 29, 87, 31, 68, 105, 28, 72, 15, 24, 30, 66, 13, 50, 10, 62.

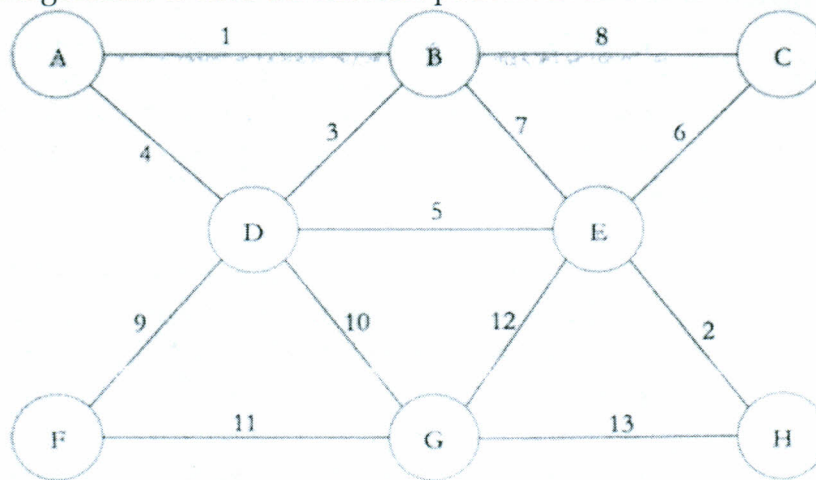
Construct the AVL tree and also Find out post order of final BST

Delete the nodes 15, 68, 10 from the tree one by one?

OR

Q.6B Explain the significance of multi-level indexing with an appropriate example? 05
What are inverted files? Why they are needed?

Q.7 Use Dijkstra algorithm to find the shortest path from all nodes to all nodes. 10



Q.8 Draw the binary max heap that results from inserting: 10
20, 10, 5, 30, 40, 57, 3, 2, 4, 35, 25, 18, 22, 21.

Sort the numbers using heap sort from above max heap? Also write complexity of heap sort algorithm?

OR

Q.8 What are circular queues? Write down algorithms for inserting and deleting elements from a circular queue implemented using arrays. 10