NIRMA UNIVERSITY

Institute of Technology

Semester End Examination (IR/RPR), December-2020

B. Tech. in Computer Science and Engineering, Semester – III

2CS301 – DATA STRUCTURES AND ALGORITHMS

Time: 1.5 Hours Max Marks: 40

Instructions:
1. Attempt all questions.
2. Figure to right indicate full marks
3. Assume suitable assumptions if required and specify them.

Q-1 Answer the following. **[10]**

A) CO1 Convert given infix expression to postfix expression using stack. Show the content of the stack and postfix expression after each symbol of the infix expression is processed. **06**

A - (B + (C ^ D ^ E) * F - G) / ((H - I) * J - K)

B) CO1 Suppose a three-dimensional array ARR is declared using ARR[2:8, -4:5, 6:15]. Find the memory address of ARR[5, 3, 11], if base address of an array ABC is 1000 and there are W=4 words per memory cell. Elements are stored in column major order representation. Show all the intermediate steps. **04**

Q-2 Answer the following. **[10]**

A) CO3 Draw an AVL tree by inserting the following list of integers in order of their occurrence. **06**

48, 22, 10, 5, 8, 4, 33, 21, 9, 13.

Delete 13, 5 and 22 from resultant AVL tree. Show all intermediate steps after each insertion and deletion operation.

B) CO3 Construct the binary tree from the following given sequences. **04**

Inorder = {alice, bill, dave, fred, jane, joe, judy, marry, tom}

Postorder = {alice, dave, joe, jane, fred, bill, tom, marry, judy}

Show all the intermediate steps of tree construction process.

Q-3 Answer the following. **[10]**

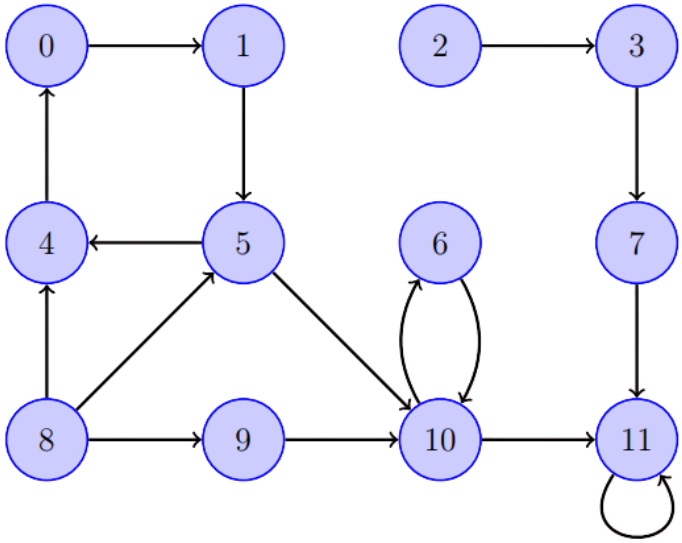
A) CO2 Insert the keys 5, 25, 15, 35, and 95 into an initially empty hash table of length 10 with following hash function. **05**

h'(x) = (h1(x) + i * h2(x)) % 10, i= 0, 1 , 2.....n

Where h1(x) = x % 13 and h2(x) = 7 – (x % 7)

Show all the intermediate steps and display resultant hash table.

B) CO3 Give DFS traversal sequence starting from node 0 of the graph given below. Show all the intermediate steps. **05**



OR

B) CO3 Construct the minimum spanning tree of weighed undirected graph represented by an adjacency matrix given below for vertex set V={ A, B, C, D, E, F, G, H } using Kruskal's algorithm. Values in the matrix represents the weight between two vertices. **05**

	A	B	C	D	E	F	G	H
A			6	5	7			
B				3		8		
C	6					7		
D	5	3						2
E	7						4	
F		8	7				8	7
G					4	8		
H				2		7		

Q-4 **Answer the following.** **[10]**

A) CO1 Assume we have a priority queue split into several queues. To access these queues we have an array of linked list to the front and rear of each queue. This representation allows each queue to be of different length. Write an algorithms to perform insertion and deletion operation on priority queue for above representation. **05**

OR

A) CO1 A company fills cylinders with a certain liquid. The number of cylinders arriving at the filling unit are unknown in advance. The cylinders arrive randomly with dimensions encoded on their surface. On the conveyer belt the volume of the cylinder is calculated and they are placed in decreasing order of their volume before sending to the liquid filling unit. Identify a suitable data structure that can store cylinder dimensions and write an algorithm to simulate the above process. [Volume of cylinder=3.14 * r^2 * h, where r=radius and h=height] **05**

B) CO2 Identify a sorting technique that sorts the given set of data in ascending order without comparing the elements. Sort the following data using the suggested sorting technique. Show all the intermediate steps. **05**

5644, 2634, 465, 897, 345, 313, 4678, 3, 476, 152, 9, 38

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