Roll no...........

IInd SEMESTER   B.Tech.

END TERM EXAMINATION   May-2024

CS104 Data Structures

Time: 03:00 Hours   Max. Marks: 40

> Note : Attempt any 5 questions. All questions carry equal marks. Use C code/pseudo code to express the algorithms. Assume suitable missing data if any.

I missed value : 1/2

Q.1 (a) Consider following array elements : 42, 23, 74, 11, 65, 58, 94, 36, 99, 87. What will be array contents if this array is converted to a MaxHeap? Also write algorithm to convert an array into MaxHeap (2)

In words : 1

not of parts : 2
Shown with eg. 1 only
algorithm some code : 1
written some code (not understoodable) : 2

(b) Write an efficient algorithm to merge two sorted link list into one sorted link list without using extra space for merging. (few temporary pointers can be used). What is the time complexity of you algorithm? (3)+(1)

[4+4][CO2]

RC not given : 3. | written smthg : 1/2 | written level order - 1 | written in words properly - 3 | only level order : 2
assume bst : 1
written in words : 1/2

Q.2 (a) Write an algorithm to print range of numbers stored in a binary search tree. For every element x in BST, if a ≤ x ≤ b then range is [a, b].

array not shown in code : 3

written in words : 1
RC no not used : 3.
BC not written : 3

(b) Write an algorithm to check if two binary trees T1 and T2 are identical or not.   [4+4][CO3]

given only one call : 1/2
ht : 0
written in words properly : 3

Q.3 Consider a B-tree of order 6. Perform the following operations on tree given in figure (a)

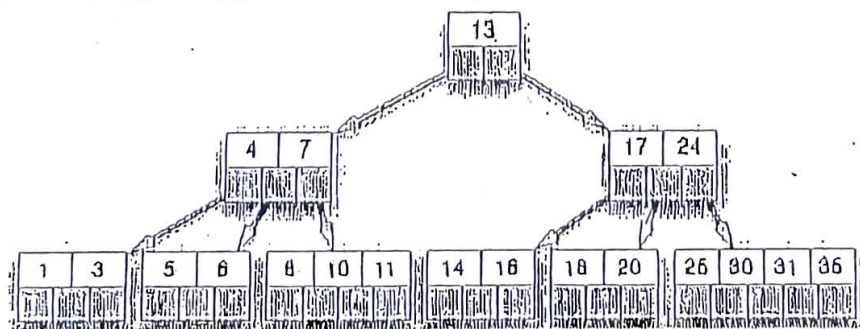Figure (a)

(i) Insert 26 followed by 45 in B-tree of figure (a)
(ii) Delete 20 from B-tree given in figure (a)
(iii) Delete 3 from B-tree given in figure (a)

[2+2+4][CO4]

completely wrong (some merging & borrowing) : 1/2

chaining concept: shown independently: collision not resolved: 3.

Q.4 (a) Insert the keys 79, 69, 98, 85, 27, 50 into the Hash Table of size 13. Resolve all collisions using Double Hashing where first hash-function is $h1(k) = k \bmod 13$ and second hash function is $h2(k) = 1 + (k \bmod 11)$. Collision at second hash can be resolved using linear probing. Draw the hash table after all numbers are inserted.

(b) Construct the AVL tree using following elements: 35, 15, 40, 7, 10, 100, 28, 82, 53, 25, 3. Show diagrammatically each step of construction of BST. *missed 1 value: 3½ wrong entries: 2* [4+4][CO3, CO5]

Q.5 (a) Modify DFS algorithm to check if given undirected unweighted graph is a tree or not. *only mentioned cycle: ½ 1st part in words: 1*

(b) Given an undirected unweighted graph G(V,E). Using BFS on this graph, write algorithm to print shortest path from vertex 1 to all other vertices in terms of number of edges. Write BFS algorithm also. You *BFS: 3* need to print the details in following format (example only).: *Dijkstra alg: 1*

Vertex	length of shortest path	shortest path detail
2	2	1→4→2
3	3	1→4→5→3
...	...	...

only BFS with alg: ½

written in words: 2

[4+4][CO5]

BFS body: 2

Q.6. Implement a priority queue using an array as minHeap. Lowest key value is considered as highest priority. Write following methods/algorithms for this priority queue:

(a) capacity() : returns maximum size of queue.
(b) isEmpty()
(c) isFull()
(d) enqueue() : insert new element in queue.
(e) dequeue() : delete smallest element from queue.
(f) makeEmpty(): delete all elements of queue.
(g) minValue() : tells what is smallest value stored in queue.
(h) decreaseValue(i, delta): reduces value of ith element by delta.

[1x8][CO1]