Course Code : CST 320 KOLP/RW – 19 / 9544

Sixth Semester B. E. (Computer Science and Engineering) Examination

ADVANCED DATA STRUCTURES

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—
   (1)   All questions carry equal marks.
   (2)   Mention comments properly before writing the algorithms.

1.   (a)   Illustrate Extendable hashing on following data set:
           [4128, 4483, 5523, 7755, 9029, 7029, 5519, 1964, 2109, 1097]
           Assume hash function as h(x) = x mode 64. The bucket size is = 3
           and gain factor = 2. [For indexing LHS bits are used].
           Demonstrate the variation in data locations if it is required to insert element
           2215, 4903 and 7632 in the hash table.   5 (CO 1)

     (b)   Demonstrate the implementation of cuckoo hashing on following data set:
           [190, 815, 175, 170, 130, 415, 610, 155, 215, 115].
           Hash table size = 6 locations. [Use suitable hash function].
           Identify deadlock situation if any exist in the hash table.   5 (CO 1)

2.   Solve any **Two** :

     (a)   Refer the tree as shown in the figure. Draw the tree after inserting node
           "11" in the tree. Write an algorithm for insertion explaining various possibilities
           of insertion [8,5,12,19 = BLACK NODES]. Comment on time complexity
           of insertion algorithm.
   Write any two application of RB Tree as data structure.
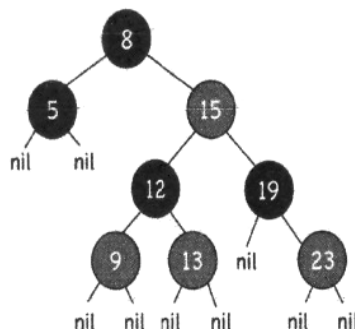
                                                                          5 (CO 2)

(b) Differentiate RB and Top down RB tree. What are three insertion rules for top down RB tree ? Out of bottom up and top down which method will be suitable for insertion ? 5 (CO 2)

(c) Explain with suitable example, various scenarios in Top-Down insertion of a node in Red-Black Tree. 5 (CO 2)

3. Solve any **Two** :—

(a) Write an algorithm to perform insert operation on B-Tree. Demonstrate the process of insertion on following tree when node Q is inserted. Perform run operation on algorithm. What is role of split procedure in B-Tree insertion operation ?
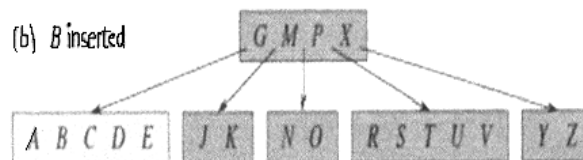
5 (CO 2)

(b) Design pseudo code to print the contents of B-Tree. Assume Inorder traversal for printing the contents. 5 (CO 2)

(c) Demonstrate the role of Garbage collector in JAVA environment. 5 (CO 2)

4. (a) Given string and pattern, write different steps to locate the pattern in the string.

String : **a b a b b b c a b b a c a b b a b a**

Pattern : **b b a c a b b**

Compute total number of comparison required for locating the pattern in the string. State the time complexity of the process. 5 (CO 3)

(b) Create the M-LCS matrix for two strings :

String 1 : Invention
String 2 : Intention
Comment on time and space complexity of the algorithm. 5 (CO 3)

5. (a) For the following given set of points construct PST [priority search tree]. A(-1, 8) B(2, 4) C(1, 5) D(4, 5) E(-2, 10) F(5,9) G(3, 7) H(2, 8) I(1, 6) J(7, 4) If it is required to insert the point (3, 1), demonstrate the process of insertion. If it is required perform query execution on the tree, find out total number of comparison and points involved in process to find out following points B(2, 4), G(3, 7). 5 (CO 4)

(b) Implement the KD tree creation on the following two dimensional dataset. Write the algorithm for the creation of KD tree.

(3, 6), (17, 15), (13, 15), (6, 12), (9, 1), (2, 7), (10, 19)
5 (CO 4)

6. (a) Implement Randomized Quick sort on following array
[9, 14, 5, 12, 45, 4, 89, 72]
Comment on time complexity of randomized algorithm. 5 (CO 4)

(b) Write vertex cover algorithm. If same algorithm is implemented using approximation, discuss the effect on execution speed of algorithm. 5 (CO 4)