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825 (DS)

[20-HKPGDEN-M2S(N)21J]

PGCA/ScIT/PGDCA 2nd Semester (New) Exam., 2020

DATA STRUCTURE THROUGH C LANGUAGE

[PGCA/ScIT/PGDCA-S2-02]

Full Marks : 50

Time : 2 hours

The figures in the margin indicate full marks for the questions

1. *(a)* Answer the following questions : 1×4=4

(i) Define abstract data type.

(ii) Define splay trees.

(iii) Define graph.

(iv) Define binomial heap.

(b) Fill in the blanks : 1×2=2

(i) Deletion is done at _____ end in a queue.

(ii) The color of a new node to be inserted in a red-black tree is _____.

(c) Choose the correct answer : 1×2=2

(i) The stack is based on the rule

(1) first-in-first-out

(2) last-in-first-out

(3) Both (1) and (2)

(4) None of the above

(ii) What is the maximum number of node in a binary tree at level i?

(1) 2

(2) 2^n

(3) 2^i

(4) $2 * i$

2. Answer any *four* from the following questions : 2×4=8

(a) Prove that $2n^2 + n + 4 = \Theta(n^2)$.

(b) Why are circular queues needed?

(c) Evaluate the following postfix notation :

$$4 * 5 + (2 - 3 * 7) + 2 / 8$$

(d) Use radix sort to sort the array

$$D = \{567, 234, 965, 437, 864\}$$

(e) Explain the concept of partition.

(Continued)

3. Answer any *four* from the following questions : 4×4=16

(a) What are the two ways of implementing stacks? Which one is preferred over the other and why?

(b) Give the properties of a red-black tree.

(c) Construct a binary search tree with the following data points :

$$C = \{15, 6, 17, 23, 90, 45, 10\}$$

(d) Define priority queue. Explain an example of an application of priority queue.

(e) Using an example, show left rotation and right rotation in an AVL tree.

4. Answer any *three* from the following questions : 6×3=18

(a) Show the results of inserting the following keys in order into an empty B-tree with minimum degree 3 :

$$\{F, S, Q, K, D, Z, E, A, X\}$$

(b) Write a program to implement binary search.

(c) Write the algorithm for breadth-first traversal in graphs.

(d) Sort the following numbers in ascending order using selection sort. Show all the passes :

12, 43, 5, 87, 14, 65, 32, 54

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