2021

COMPUTER SCIENCE — HONOURS

Paper : CC-3

(Data Structure)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question No. 1*** and ***any four*** from the rest.

1. Answer ***any five*** questions: 2×5

(a) Give the formal definition of a linear array.

(b) Write the formula to find the location of any element of a one dimension linear array having base address (BA) and n number of words per memory cell.

(c) Represent the following polynomial using linked list:

$P(x) = 2x^6 - 3x^5 + 7x - 8.$

[Note: The list must have a header node.]

(d) Define a deque. What are its two variations?

(e) Convert the following postfix expression P into its equivalent infix for m. Then evaluate the infix expression. [Convert by inspection]

P : 16, 7, 3, –, /, 8, 4, 5, +, *, +.

(f) State the two main properties of a well defined recursive procedure.

(g) Draw a complete binary tree having 28 nodes.

(h) Best case running time of Quick Sort is $0(n \log n)$ — Justify.

2. (a) Build a heap H from the following list of numbers:

54, 40, 60, 22, 70, 56, 87, 35.

(b) Suppose LIST is a linked list in the memory. Write an algorithm to delete the last node from LIST. 5+5

3. (a) Write an algorithm to find an ITEM from a sorted list of elements.

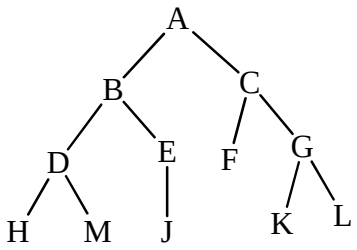
(b) Show the steps to sort the following list of numbers in ascending order using QUICKSORT:

46, 52, 35, 76, 40, 27, 16, 38, 63, 15. 5+5

Please Turn Over

4. (a) What are sparse matrices? Illustrate with an example a lower triangular matrix.

(b) Name the three standard algorithms used to traverse a binary tree. Traverse the following tree in the above mentioned methods:



3+(1+6)

5. (a) Why are threads used in binary trees?

(b) What are the properties of a BST? Write the steps to insert an ITEM in a BST at its appropriate place. 2+(2+6)

6. (a) State the names of different hashing functions used generally. Explain them briefly.

(b) How is collision resolved using open addressing?

(c) State the main disadvantage of linear probing. 6+2+2

7. (a) Write an algorithm to implement Merge Sort.

(b) Write an algorithm to insert nodes in a queue represented by a linked list. 6+4

8. (a) Illustrate with proper explanation, a technique that will minimize the overflow in a stack maintained in an array.

(b) What are priority queues? How are they maintained in memory? 6+(2+2)

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