



WEST BENGAL STATE UNIVERSITY  
B.Sc. Honours 3rd Semester Examination, 2023-24

CMSACOR05T-COMPUTER SCIENCE (CC5)

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

GROUP A

1. Answer any *four* from the following:

2×4 = 8

- (a) What is the advantage of using polish notation in computers?
- (b) Write one advantage of circular linked list over singly linked list.
- ✓(c) When does the worst case for Bubble sort occur?
- ✓(d) What is a height balanced BST?
- ✓(e) What is deque?
- (f) What is tail recursion?
- ✓(g) Write postfix form of the following:

$$(A + B) * D + E / (F + A * D) + C$$

GROUP B

Attempt any *four* questions

8×4 = 32

2. Write an algorithm to implement queue using stack. Prove that the maximum number of nodes on level  $i$  of a binary tree is  $2^{i-1}$ ,  $i \geq 1$

4+4

✓3. Write an algorithm to reverse a link list. What is threaded binary tree? Explain with an example.

4+4

4. (a) Imagine a hash-table of size 10. Using the hash function  $f(i) = i \% 10$ , and open addressing with linear probing for collision resolution, insert the following four keys one by one into the hash table : {2, 13, 22, 4}. Show the contents of the hash table after each insertion.

4

(b) Prove that a tree with  $n$  nodes has exactly  $n - 1$  edges.

4

5. (a) Write an algorithm to delete an element from a circular queue. 4  
(b) Write a program in C/C++ to find duplicate elements in an array. 4
6. (a) Give a memory efficient storage representation for sparse matrices. 4  
(b) Based on the representation you suggested above for sparse matrices, now write an algorithm to add two sparse matrices. 4
7. (a) Reconstruct the original binary tree from the following sequences: 4  
Inorder sequence: D, G, B, H, E, A, F, I, C  
Preorder sequence: A, B, D, G, E, H, C, F, I
- (b) Compare the best and worst case time complexity of searching an element in a linked list versus an array. 4

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