University of Engineering & Management, Kolkata

Odd Semester Term- II Examination, October-November, 2021

Programme Name: B.Tech in Computer Science   Semester: 3rd

Paper Name: Data Structure & Algorithms

Paper Code: PCC CS301

Full Marks: 100   Time: 3 hours

Group A (20 marks)

Answer the following questions. Each question is of 2 marks.

Q. No. 1.

- **(i)** Convert into post-fix expression: A+B*C/D
- **(ii)** Mention what is the difference between Linear Array and Linked List?
- **(iii)** State the difference between singly and doubly linked lists?
- **(iv)** When a queue can be considered as full?
- **(v)** What is the utility of learning postfix expression?
- **(vi)** Explain the significance of height of a search tree.
- **(vii)** Differentiate between BST & B-Tree.
- **(viii)** Define thread.
- **(ix)** What is the requirement of a good hashing function?
- **(x)** What do you mean by stable sorting? How does it differ from unstable sorting?

Group B (30 marks)

Answer the following questions. Each question is of 5 marks.

Q. No. 2.   "Evaluate the following postfix expression using stack-

5, 6, 2, +,*,12,4,/,-"

Q. No. 3.   Construct a binary search tree with the following numbers: 4, 6, 2, 8, 3, 23, 12, 8, 10, 11. Then delete the smallest number and root of the tree in sequence.

Q. No. 4.   Derive the average case time complexity of quick sort.

Q. No. 5.
   A. "Consider a linear queue in which FRONT=1 & REAR=5. Elements at present moment-

      A, B, C, D, E. Now perform the following. Show all steps. Add F (b) Delete two letters(c)

      Add G (d) Add H (e) Delete four letters (f) Add I. "

<div align="center">or</div>

   B. Explain tail recursion. Write a recursive C function to find factorial of a number.

Q. No. 6.
   A. Construct a heap (max) tree with the following inputs: 1,3,4,6,3,8,9,12,14,2.

<div align="center">or</div>

   B. Construct a expression tree for the given expression and then evaluate that from the
      tree itself.
      Expression: A + B / C * D – E (Consider all values are Fibonacci numbers)

Q. No. 7.
   A.   What is hashing? Give example. Write two different types of hash functions.

<div align="center">or</div>

   B.   What is the difference between open addressing and chaining as collision resolution
      techniques in hashing?

<div align="center">

Group C (50 marks)

Answer the following questions. Each question is of 10 marks.

</div>

Q. No. 8.   Explain algorithms for PUSH(), POP(), PEEK() and DISPLAY() operations in a
stack using single linked lists.

Q. No. 9.   Construct a B Tree of order 5 with the given set of numbers: 11, 7, 21, 18, 8, 27,
39, 36, 42, 54, 45, 72, 4, 90, 63, 81, 89. Then perform the following deletions in sequence:
delete 27, 4 and 45.

Q. No. 10.

   A. Explain the merge sort algorithm. Analyze why it runs faster than bubble sort in most of
      the cases.

<div align="center">or</div>

B. Compare and contrast among the different time complexities of linear search, binary search and interpolation search techniques.

Q. No. 11.

A. Write down a C program to delete a node from the beginning and end of a doubly linked list.

or

B. "Convert the following infix expressions to postfix expression using stack:

a. (A − B) + C * D / E − C

b. ((A − B) + D / ((E + F) * G))

Q. No. 12.

A. Calculate Huffman code for the letters used in the given string : "Espresso express". Also calculate the percentage of space that can be saved if we use Huffman coding to store the string.

or

B. There is a flight route which covers all the metro cities, namely D, K, C, M. (Take the cities in a clockwise fashion). To save the fuel they need optimized route between every two cities. Direct distance between D & K is 8 unit, K & C is 12 unit, C & M is 6 unit, M & D is 10 unit, M & K is 14 unit, D & C is 9 unit. Please help the operator using suitable algorithm.