National Institute of Technology Kurukshetra
Department of Computer Engineering
Data Structures(AIPC100,DSPC100)
Mid Exam-I, FEB-2025

Timing: 50 Mins. Max Marks: 15

All the Questions are Compulsory.

1. (a) Find out the postfix expression for the infix expression A + B*(C+D)/F + D*E. (2)

   (b) Consider the following two functions
   $f(n) = n^3$, if $0 \leq n < 10000$ otherwise n^2.
   $g(n) =$ if $0 \leq n < 100$ otherwise $n^2 + 5n$
   Find out the time complexity for the above functions. (2)

   (c) Stack A has 3 Elements in it Say X, Y and Z with X on top.
   (a) Stack B is empty.
   (b) An Element popped out from Stack A can be printed immediately or pushed to stack B.
   (c) An Element popped out from Stack B can only be printed. In this arrangement, which of the following permutations of X, Y, Z are not possible? Explain in detail.
   (a) YXZ (b) ZYX (c) ZXY (d) YZX (2)

2. Given a queue of integers, rearrange the elements by interleaving the first half of the list with the second half of the list. For example, suppose a queue stores the following sequence of values: [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]. Consider the two halves of this list: first half: [11, 12, 13, 14, 15] second half: [16, 17, 18, 19, 20]. These are combined in an alternating fashion to form a sequence of interleave pairs: the first values from each half (11 and 16), then the second values from each half (12 and 17), then the third values from each half (13 and 18), and so on. In each pair, the value from the first half appears before the value from the second half. Thus, after the call, the queue stores the following values: [11, 16, 12, 17, 13, 18, 14, 19, 15, 20]. Write an algorithm to implement it and a C program for the same. (5)

3. Consider the following array $[32, 33, 5, 2, 14, -4, 22, 39, 34, -9]$

   We apply a certain sorting algorithm and observe that the array has been modified to $[2, 5, 14, 32, 33, -9, -4, 22, 34, 39]$ while the sorting algorithm is in progress (not yet completed).

   Which of the following sorting algorithms could we possibly have applied?
   (a) Merge Sort
   (b)Insertion Sort
   (c)Bubble sort
   Write the answer with proper justification. After finding the correct algorithm write a C program for the same. (4)