

MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

Sessional Examination – I : Odd Semester 2022-23

Course/Branch : B Tech - CSE/IT/CSIT/CSAI/CSAIML/CSDS/CSIOT Semester:III
 Subject Name : Data Structure Max. Marks: 60
 Subject Code : KCS301 Time : 120 min

CO-1 : On completion of this course, the student will be able to understand algorithm, complexity of algorithm and linear and nonlinear data structure.

CO-2: On completion of this course, the student will be able to implement array and linked list.

Section – A (CO – 1 & CO-2) # Attempt both the questions # 30 Marks

Q.1 : Attempt any SIX questions (Short Answer Type). Each question is of two marks.
 (2 x 6 = 12 Marks)

- a) Define data structure. Describe about its need. (BKL : K2 Level). CO1
- b) Explain time-space trade-off. (BKL : K2 Level). CO1
- c) Discuss abstract data type (ADT)? (BKL : K2 Level). CO1
- d) Define algorithm. Explain the criteria an algorithm must satisfy. (BKL : K2 Level). CO1
- e) Differentiate between overflow and underflow condition in an array. (BKL : K2 Level). CO1
- f) Write the traversing algorithm for a linear array. (BKL : K2 Level). CO1
- g) Rank the following typical bounds in increasing order of growth rate: (BKL : K2 Level). CO1 (HOT)

$O(\log n)$, $O(n^4)$, $O(1)$, $O(n^2 \log n)$

Q.2 : Attempt any THREE questions (Medium Answer Type). Each question is of 6 marks.
 (3 x 6 = 18 Marks)

- a) Consider the two dimensional lower triangular matrix (LTM) of order N, derive the formula for address calculation in the address of row major for location LTM [j] [k], if base address is BA and space occupied by each element is w byte. (BKL: K3 Level). CO2
- b) What are the various asymptotic notations ? Explain its various types. (BKL: K3 Level). CO2
- c) How 2D array is represented in memory ? Show the matrix form of [1, 4, 6, 9, 8, 5, 2, 3] with 4 rows and 2 columns in row major order and column major order. (BKL: K3 Level). CO2
- d) Consider the linear arrays AAA [5 : 50], BBB [- 5 : 10] and CCC [1 : 8].
 - (i) Find the number of elements in each array.
 - (ii) Suppose base (AAA) = 300 and w = 4 words per memory cell for AAA. Find the address of AAA [15], AAA [35] and AAA [55]. (BKL K3 Level). CO2
- e) Suppose multidimensional arrays P and Q are declared as P(- 2: 2, 2: 22) and Q(1: 8, - 5: 5, - 10 : 5) stored in column major order: (BKL K3 Level). CO2 (HOT)
 - (i) Find the length of each dimension of P and Q and the number of elements in P and Q.
 - (ii) Assuming base address (Q) = 400, W = 4, find the effective indices E1, E2, E3 and address of the element Q[3, 3, 3].

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Section – B (CO1 & CO - 2) # Attempt both the questions # 30 Marks

Q.3 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)

- ✓ a) Differentiate between array and linked list. (BKL : K1-K2 Level). CO1
- ✓ b) Discuss about the header linked list. (BKL : K1-K2 Level). CO1
- ✓ c) Under what condition, a doubly linked list more beneficial than singly linked list. (BKL : K1-K2 Level). CO1(HOT)
- ✓ d) Write the structure for doubly linked list. (BKL : K1-K2 Level). CO1
- ✓ e) Explain generalized link list. (BKL : K1-K2 Level). CO1
- ✓ f) Explain overflow condition in link list. (BKL : K1-K2 Level). CO1
- ✓ g) Draw the memory representation of link list with the help of an example. (BKL : K1-K2 Level). CO1

Q.4 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)

- ✓ a) Write an algorithm or C code to insert a node in doubly link list in beginning. (BKL: K3 Level). CO2
- b) What do you mean by polynomial representation? Write the procedure for the addition of two polynomials. (BKL: K3 Level). CO2
- c) Write a program in C to delete a specific element in singly linked list. (BKL: K3 Level). CO2
- ✓ d) What is meant by circular linked list ? Write the functions to delete the node at a given position in a circular linked list. (BKL K3 Level). CO2
- ✓ e) Write a C function to reverse a singly link list. (BKL : K3 Level). CO2(HOT)