B. E. Third Semester (Computer Technology) / SoE–2018 Examination

Course Code : CT 2204 **Course Name : Data Structures**

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Due credit will be given to neatness and adequate dimensions.
(2) Assume suitable data wherever necessary.
(3) Illustrate your answers wherever necessary with the help of neat sketches.

1. (A) (A1) Write merge sort algorithm and prove its correctness using loop invariant. 6(CO1)

(A2) State scope rules for programming languages with example. 2(CO1)

(A3) State various data types and operations. 2(CO1)

OR

(B) (B1) Write quicksort algorithm and prove its correctness using loop invariant. 6(CO1)

(B2) State and explain various parameters passing mechanisms. 2(CO1)

(B3) Illustrate recursion stack with example. 2(CO1)

2. (A) (A1) Write binary search algorithm and show its stepwise execution on the following array for key = 50

A[10] = {5, 12, 23, 34, 45, 56, 67, 78, 89, 95} 6(CO1)

(A2) State linear search algorithm. 2(CO1)

(A3) Represent the given sparse matrix using array representation.

$$\begin{bmatrix} 9 & 0 & 5 & 8 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 6 & 0 & 0 \\ 0 & 0 & 0 & 4 & 0 \end{bmatrix}$$ 2(CO1)

OR

(B) (B1) Write insertion sort algorithm and show its stepwise execution on the following array.

A[10] = {3, 7, 2, 5, 12, 10, 11, 4, 6, 1} 6(CO1)

(B2) What is sparse matrix ? 2(CO1)

(B3) Explain various representation for sparse matrix with example. 2(CO1)

3. (A) (A1) Write a program for array of structures in C. Assume suitable data. 6(CO4)

(A2) Explain polynomial representation using arrays with example. 2(CO4)

(A3) Compare static vs dynamic memory allocation. 2(CO4)

OR

(B) (B1) Write a program to demonstrate dynamic memory allocation for two dimensional array. 6(CO4)

(B2) State and explain various dynamic memory allocation function in C. 2(CO4)

(B3) What is self–referential structure ? 2(CO4)

4. (A) (A1) Write a menu driven program to implement singly linked list(pointers implementation) with at least four common operations performed on it. 6(CO2)

(A2) State and explain various types of linked lists. 2(CO2)

(A3) Compare singly linked list vs circular linked lists. 2(CO2)

OR

(B) (B1) Write a menu driven program to implement doubly linked list (array implementation) with at least four common operations performed on it. 6(CO2)

(B2) What is ADT ? Give example. 2(CO2)

(B3) Compare array vs pointer implementation for linked list. 2(CO2)

5. (A) (A1) Write a menu driven program to implement stack (pointer implementation) with basic operations performed on it. 6(CO2)

(A2) State various applications of stack. 2(CO2)

(A3) Compare stack and queues. 2(CO2)

OR

(B) (B1) Write a menu driven program to implement queue with basic operations performed on it. 6(CO2)

(B2) State various applications of queue. 2(CO2)

(B3) List four application areas of queue. 2(CO2)

6. (A) (A1) Explain various index techniques for files with example. 6(CO3)

(A2) What is sequential file organization ? 2(CO3)

(A3) What are different query types for files ? 2(CO3)

OR

(B) (B1) Explain different file organizations with illustrations. 6(CO3)

(B2) Explain storage management system for disk. 2(CO3)

(B3) What is garbage collection and compaction for external storage? 2(CO3)