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## End Semester/ Back Examination 2024-205

Name of the Course: B.Tech (CSE)

Semester: 4<sup>th</sup>

Name of the Paper: Data Structures with C

Paper Code: TCS302/IBTCS302

Time: 3 Hour's

Maximum Marks: 100

**Note:**

- (i) All Questions are compulsory.
- (ii) Answer any two sub questions among a, b and c in each main question.
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks.

**Q1**

**(10 X2 = 20 Marks)**

- (a) What is an algorithm? Write the algorithm to find the 2<sup>nd</sup> largest number from an array contains n numbers in linear order time complexity. CO1
- (b) Write the algorithm / function to perform the binary search operation on sorted array of integer data items and also explain its time complexity. CO2
- (c) Explain the working of merge sort technique using suitable example. CO2

**Q2**

**(10 X2 = 20 Marks)**

- (a) What is data structure, explain with example. Explain any three operations on linear data structure with appropriate example of each operation. CO1
- (b) Write the algorithm/ function to implement the stack using link list for the following operations:  
(I) Push (II) Pop (III) Display CO3
- (c) What are the limitations of linear queue and how it can be eliminated in circular queue? Explain with example. CO3

**Q3**

**(10 X2 = 20 Marks)**

- (a) Write a C function to print all perfect square numbers stored in a singly link list pointed with pointer "head" (The perfect square number is a number whose square root is always whole number like 16,25 etc). CO4
- (b) Demonstrate the procedure for the insertion (after last node) and deletion (last node) operations on a doubly link list pointed by "head" pointer using example of each operation. CO4
- (c) Write an algorithm/ function to count the total number of nodes in a circular doubly link list pointed by "start" pointer. CO4

**Q4**

**(10 X2 = 20 Marks)**

- (a) Explain the deletion (for all the cases) operation in binary search tree using examples of each case. CO4
- (b) Create a five-node completely connected undirected graph and represent the constructed graph using adjacency matrix representation of graph. Also print the vertices of the graph using DFS traversal technique. CO5



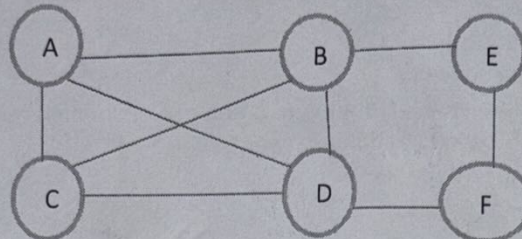
- ✓(c) What is hashing? Explain any two hashing functions with example. Also discuss any one collision handling technique in detail. CO5

Q5

(10 X 2 = 20 Marks)

- ✓(a) Create a binary search tree using following information by reading information from left to right:  
50,40,55,30,60,67,37,45,69,64,15,25,5,70  
Print the information of the above constructed tree using in-order and pre-order traversal techniques. CO4

- ✓(b) Draw all possible spanning trees of the graph shown in the following figure:



CO5

- (c) How a linear queue can be implemented using stack? Explain the insertion & deletion procedure with suitable example. CO3