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# ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)
## B.E. / B. Tech / B. Arch (Full Time) – ARREAR END SEMESTER EXAMINATIONS, NOV/DEC 2024
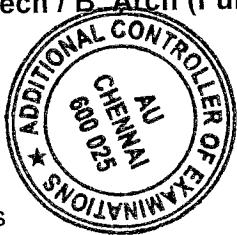
INFORMATION TECHNOLOGY
Semester III
**IT5352  Programming and Data Structures**
(Regulation 2019)

Time: 3hrs

Max.Marks: 100

| CO 1 | Develop C programs for any real world/ technical application. |
|------|---------------------------------------------------------------|
| CO 2 | Apply advanced features of C in solving problems. |
| CO 3 | Write functions to implement linear and nonlinear data structure operations. |
| CO 4 | Suggest and use appropriate linear/ nonlinear data structure operations for solving a given problem. |
| CO 5 | Appropriately use sort and search algorithms for a given application. |
| CO 6 | Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval. |

**BL – Bloom's Taxonomy Levels**
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

## PART- A (10 x 2 = 20 Marks)
### (Answer all Questions)

| Q. No | Questions | Marks | CO | BL |
|-------|-----------|-------|----|----|
| 1 | Compare iterative and recursive functions with an example. | 2 | CO1 | L2 |
| 2 | Write the output of the following C code:<br>#include <stdio.h><br>int main()<br>{<br>    int a = 7, b =8, c =9;<br>    a = b++; c = --a; b = b--+ --c;<br>    printf("%d %d %d", a, b, c);<br>} | 2 | CO1 | L3 |
| 3 | Write down the significance of Pointer to a Pointer? When will you use it? Give an example. | 2 | CO2 | L2 |
| 4 | Illustrate the usage of an Enumerated Data type with an example. | 2 | CO2 | L2 |
| 5 | What are linear and nonlinear data structures? Give an example for each. | 2 | CO3 | L2 |
| 6 | Write a C program to compute Factorial using Recursion. | 2 | CO3 | L3 |
| 7 | How do you compute height and depth of a binary tree? | 2 | CO4 | L2 |
| 8 | Define a Hash function. | 2 | CO6 | L1 |
| 9 | Differentiate Max Heap and Min Heap. | 2 | CO5 | L2 |
| 10 | Write a C program to perform Linear Search for a given set of elements. Write down its best and worst complexity. | 2 | CO5 | L3 |

## PART- B (5 x 13 = 65 Marks)
### (Restrict to a maximum of 2 subdivisions)

| Q. No | Questions | Marks | CO | BL |
|-------|-----------|-------|----|----|
| 11 (a) (i) | Write a C program to find whether the given number is an Armstrong number or not. | 7 | CO1 | L3 |

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| | | (Note: Armstrong number defines the sum of the cubes of every digit of the number is equivalent to that number. For example 1^3+ 5^3 +3^3 = 153) | | | |
| | (ii) | Explain any four String manipulation functions with a suitable example for each. | 6 | CO2 | L2 |
| | | **OR** | | | |
| 11 (b) (i) | | Write a C program to read a 2-D matrix and display the sum of the elements above and below the diagonal. | 7 | CO1 | L3 |
| | (ii) | Differentiate Call by Value and Call by Reference functions with a suitable example on your own. | 6 | CO2 | L2 |
| 12 (a) | | Create a Structure named **Employee** with the following fields: Employee ID Employee Name (Character Array) Date of Birth (Nested Structure) Salary Experience Using the above representation, write suitable functions to implement the following operations for the Employee structure: a) Adding an Employee b) Display the details of an employee given Employee ID c) Increase his salary by 10% if he has more than 10 years of experience. | 13 | CO2 | L3 |
| | | **OR** | | | |
| 12 (b) (i) | | Write a C program to perform the following operations in a FILE: a) Open the file in Write mode and store the detail of a Student (Student ID, Student Name). b) Read the file to find a particular student detail based on his student ID c) Total number students written in a file. | 8 | CO2 | L3 |
| | (ii) | Compare the usage of Structures and Union with a suitable example for each. | 5 | CO2 | L2 |
| 13 (a) (i) | | Implement a Stack ADT to perform PUSH , POP and DISPLAY operations using Array Implementation. | 9 | CO3 | L3 |
| | (ii) | Consider a Circular queue of size 5. What would be the FRONT and REAR position after each of the following operation. (Simulate step by step operation):  1. Enqueue A, B, C 2. Dequeue 3. Dequeue 4. Enqueue D, E, F, G 5. Dequeue 6. Dequeue | 4 | CO3 | L3 |
| | | **OR** | | | |
| 13 (b) (i) | | Write a C program to perform insertion, deletion and search operations in a Doubly linked list implementation. | 9 | CO3 | L3 |
| | (ii) | Convert the following infix to postfix expression using STACK. Show the step by step simulation while converting infix to postfix. ( A + B * ( C - D ) ) / E | 4 | CO3 | L3 |
| 14 (a) (i) | | Simulate the insertion of following numbers into an initially empty Binary Search Tree: 120, 111, 112, 126, 154, 178, 145, 136, 196, 121, 184, 163  After constructing the tree, write down the in order, preorder and post order traversal of it. | 9 | CO4 | L3 |

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| (ii) | Construct an Expression tree for the following postfix expression using Stack:<br>abc+edg*-*+ | 4 | CO4 | L3 |
| | OR | | | |
| 14 (b) | Explain about the various Collision Resolution strategies in Open Addressing scheme with a suitable example. | 13 | CO6 | L3 |
| 15 (a) (i) | Sort the following numbers using Merge Sort and show the step by step simulation:<br>22, 9, 10, 1, 25, 11, 12, 19, 21 , 19, 83, 13, 99, 103, 200 | 9 | CO5 | L3 |
| (ii) | Write a C program to search a given element using Binary Search | 4 | CO5 | L3 |
| | OR | | | |
| 15 (b) (i) | Write a C program to sort the given set of elements using Quick Sort. | 9 | CO5 | L3 |
| (ii) | Given the following set of numbers, how do arrange the numbers in ascending order using Insertion Sort? Show the steps involved in arranging the numbers:<br>12  23  15  8  109  28  62 46 | 4 | CO5 | L3 |
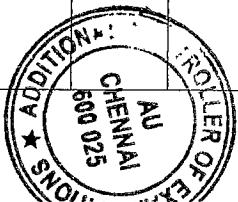
## PART- C (1 x 15 = 15 Marks)
### (Q.No.16 is compulsory)

| Q. No | Questions | Marks | CO | BL |
|---|---|---|---|---|
| 16. (i) | Implement Binary Search ADT to perform the following operations:<br>a) Insertion of elements into the tree<br>b) Deletion of elements<br>c) To find the minimum element of the tree<br>d) Height of the tree | 10 | CO4 | L3 |
| (ii) | Write a C program to find whether the two given strings S1 and S2 are equal or not. Also check whether the given strings are palindrome or not. | 5 | CO2 | L5 |