

Roll No.

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**ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)**

**B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV/DEC 2021**

INFORMATION TECHNOLOGY  
III Semester  
**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 non linear data structure operations.
CO 4	Suggest and use appropriate linear/non-linear 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 - Analyzing, L5 - Evaluating, L6 - Creating)

**PART- A (10 x 2 = 20 Marks)**

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	<p>Write down the output of the following code:</p> <pre> void main() {     int i, w, p;     char st[] = "WELL";     printf("\n");     for (i=0; i&lt;4; i++)     {         p = i+1; printf("\n %5.*s", p, st);     }     printf("\n");     for (i=4; i&gt;0; i--)     {         p = i+1; printf("\n %5.*s", p, st);     }     getch(); } </pre>	2	CO1	L3
2	<p>Write down the output of the following program:</p> <pre> #include &lt;stdio.h&gt; int func1(int a) {     if (a)         return func1(--a)+a;     else         return 0; } </pre>	2	CO1	L3

	<pre> } int main() {     int a = 7;     printf("%d",func1(a));     return 0; } </pre>			
3	How do you define a pointer to a function? Illustrate its usage with an example.	2	CO2	L1
4	Write down the output of the following code: <pre> int main() {     int arr[5]= {1,2,3,4,5};     int *ptr = arr + 2;     printf("%d %d", --*ptr+1, 1+*--ptr);     return 0; } </pre>	2	CO2	L3
5	Mention the significance of ADT.	2	CO3	L1
6	Simulate a Double ended queue of size n = 9, where insertion and deletion takes place at both ends of the queue (REAR1 and FRONT1 corresponds to one end of the queue and REAR2, FRONT2 denotes the other end of the queue). Insert 54, 34, 67 and 45 at REAR1 and insert 26, 45, 32, 11 and 108 at REAR2. Delete 2 elements from FRONT1 and delete 3 elements from FRONT2. Display the status of the queue.	2	CO4	L4
7	How do you calculate the height and depth of a node in a tree? Illustrate it with an example.	2	CO3	L1
8	Simulate the construction of an expression tree for the following expression using Stack:  <pre> abe+cdg*-*+ </pre>	2	CO4	L2
9	Simulate the process of performing Insertion sort for the following set of numbers: 25 64 32 10 87 45 11 20	2	CO5	L2
10	Write a C program to perform Linear Search for the given set of numbers. Write down its best and worst case 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 all the triplicate (which appears thrice in an array) elements present in the array. In such cases, the array should hold only one occurrence of the element and delete the two more successive occurrences. Display the size of the resultant array with its elements.	8	CO1	L3
(ii)	Write a recursive function called print_backwards () which accepts a series of characters from the keyboard as input and prints all the characters backwards in the screen when terminated with a full-	5	CO1	L3

	stop. (Characters should not get stored anywhere while accepting it).			
<b>OR</b>				
11 (b) (i)	Write a C program to accept a text passage from the user. Replace every occurrence of the string "abba" by "accb" using character manipulation functions.	<b>8</b>	CO1	L3
(ii)	Write a C program that reads a 2-D matrix and displays the sum of the elements above and below the main diagonal correspondingly.	<b>5</b>	CO1	L3
12 (a) (i)	Create a cricket PLAYER using structure having Player ID, Player Name, Number of matches played, Highest Score, Number of centuries and Rating. Write suitable functions to perform the following operations: i) Create the PLAYER using memory allocation operator. Atleast six players need to be created using array of pointers. ii) Display the list of players details using array of pointers. iii) Display the Player IDs with highest score in minimum number of matches played. iv) Update the Highest score rate, Number of matches played, centuries obtained and Rating fields of the PLAYER if he obtains additional runs in new matches.	<b>9</b>	CO1 , CO2	L3
(ii)	Explain the different types of Preprocessor directives and its significance with an example for each.	<b>4</b>	CO2	L1
<b>OR</b>				
12 (b) (i)	Write a C program to accept a STUDENT using structures having Student ID, Student Name, DOB (create a nested structure with day, month and year as attributes), Address and Marks obtained as properties. Access the properties of STUDENT using suitable pointer.  a) Accept atleast a minimum of 10 student details and write it into a text file.  b) Open the text file in read mode and perform the following operations:  1. Display the names of the students who are elder than 20 years.  2. List out the Student IDs who are in the same age.  3. Append the name of the student who has secured higher marks at the end of the file.	<b>9</b>	CO1 , CO2	L3
(ii)	Illustrate the usage of Enumerated data types with a suitable C program.	<b>4</b>	CO2	L1
13 (a) (i)	Write a C program to create a list which stores the student registration number of a class where each node of the list possess the address of the predecessor and successor. Perform the following operations for the list created: 1. Students to be added into the list should wait in a Queue. 2. Add student registration number one by one into the list by dequeuing it from the queue. 3. Arrange the elements in the queue in descending order after every dequeue operation.	<b>9</b>	CO3	L5

	4. Display the status of the queue and list after inserting the student registration numbers.			
(ii)	Create a Recursion tree by illustrating the recursive calls involved in the generation of Fibonacci series where number of terms = 6	4	CO4	L2
<b>OR</b>				
13 (b) (i)	Create a Singly linked list by inserting the character elements one by one from a Stack data structure which is created using arrays. (Frame a new name by concatenating all the characters present in the list- Note: Name should contain atleast 7 characters) Perform the following operations to construct the name from the list: i. Second character of the name should be the second largest element of the Stack. ii. Fourth character of the name should be the last character of the Stack. iii. Sixth character of the name should be the topmost character of the Stack. iv. Remaining characters are fetched from the stack by leaving the characters which are used already. Display the newly formed name from the list.	9	CO3	L5
(ii)	Convert the infix expression to postfix expression. Show the simulation using Stack. $7\ 3\ 2\ ^\ / \ 3\ 2\ * \ + \ 9\ 1\ * \ - \ .$ Note that ^ is the exponentiation operator.	4	CO4	L2
14 (a) (i)	Given the input {471, 132, 617, 419, 434, 967, 198, 256, 854} and a hash function $h(X) = X(\text{mod } 8)$ , simulate and analyze the result of constructing open addressing hash table with second hash function $h_2(X) = 7-(X \text{ mod } 7)$ . Comment your opinion on it.	7	CO6	L4
(ii)	Show the result of inserting the elements 45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48 into an initially empty binary search tree. Write down the preorder and post order traversal of the final tree constructed. Further simulate the result of deleting the elements 89, 41, 115 and 23.	6	CO3	L2
<b>OR</b>				
14 (b) (i)	Compare and analyze the various advantages and disadvantages of collision resolution strategies in Open Addressing scheme with suitable examples.	7	CO6	L4
(ii)	Write a C program to calculate the path length of the given nodes present in a binary search tree.	6	CO3	L2
15 (a) (i)	Accept your name (First Name followed by Last name with space in between both the names). Initial letter of the first name and last name should be in Capital case. Simulate an encoding scheme to toggle every third character of your name into an upper case. Convert each character of your resultant name into its corresponding ASCII code and populate the array accordingly. (For example if the name is ABC, populate the array with the integers 65, 66 and 67 correspondingly). Simulate Merge sort operation in the above array to arrange the numbers in ascending order. Also simulate the decoding process to display and decode the characters from the sorted array.	8	CO5	L3
(ii)	Write a recursive C program to sort the given elements using Merge Sort.	5	CO5	L2
<b>OR</b>				

15 (b) (i)	Accept your ambitious company name where you want to get employed (Minimum of 12 characters). Encode your company name with the following constraints:  Replace every odd character of your input by its adjacent character and replace every even character with a neighboring vowel (Neighboring vowel means the vowel that follows the character subsequently in English alphabets). If the character itself is a vowel, retain the same character. Simulate the process of arranging the characters of the resultant name in alphabetical order and display the result.	8	CO5	L3
(ii)	Sort the following numbers using Heap Sort. 166 153 192 231 511 471 189 108 88 100 191 115 131.	5	CO5	L2

**PART- C (1 x 15 = 15 Marks)**

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Using a suitable data structure, create an application (using C code) named Book Index Search (BIS) which consists of Key terms, Description of key terms and Page Number. Here Key terms should be organized in a hierarchical manner based on their initial occurrences of alphabets in key terms. The application should be capable of performing the following operations: a. Whenever a new term is introduced, it must be added to the application with an appropriate key term, description and corresponding page number. b. When the key term is no longer used, its corresponding entries must be removed from BIS. c. If the key term is given as input, corresponding description should get displayed appropriately.	10	CO2 , CO4	L6
(ii)	For the application created in option (i), Find out the key terms which are frequently searched. Display the number of times each key term has been searched in descending order.	5	CO2 , CO4	L6