END SEMESTER EXAMINATION, JULY-2022
Computer Science Workshop 2 (CSE3141)

Programme: B.Tech(CSE) **Semester: 4th**
Full Marks: 60 **Time: 3 Hours**

Sec - G7

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Analysis algorithm, using time and space complexity.	L3, L4	Q1, Q2c, Q3c, Q6c	12
Understanding and effectively use ADT, java collection, sorting and searching.	L1, L3	Q2, Q3	8
Applying linked list, stack, queue on different problem solving.	L1, L3, L4	Q4, Q5, Q6, Q7, Q8	28
Applying tree, priority queue, graph on problem solving.	L1, L3, L4	Q9, Q10	12
Understanding algorithm design techniques.	L1, L3, L4		
Apply design techniques on problem solving.	L1, L3, L4		

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Applicatio (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. (a)
```
int fun(int n) {
int i, m = 0; i = 1;
while (i < n) {
m += 1;
i = i * 2;
} return m;
}
```
Analysis the time complexity of the given method.

(b)
```
int fun(int n) {
int i, j, m = 0; for (i = 0; i < n; i++) {
for (j = 0; j < Math.sqrt(n); j++) {
m += 1;
```

}}
return m; }
Analysis the time complexity of it.

(c) Binary tree traversal $T(n) = 2T(n/2) + O(1)$ 2
Analysis the time complexity of it by using master method.

2. (a) Create a static function for an array [10,20,30,40,50,60], you need to rotate its elements 2 number of times. 2

(b) Create a static function for a sorted array [1, 2, 3, 4, 5, 6, 7], rearrange it in maximum-minimum form. 2

(c) Analysis the time complexity of the Q2(a) and Q2[b] methods. 2

3. (a) Create a static function for an array containing 0s and 1s and to sort array so that 0s come first followed by 1s. Also find the minimum number of swaps required to sort the array. 2

(b) In given K sorted Lists of fixed length M. Also, given a final output list of length M*K. Write an efficient algorithm to merge all the arrays into the final list, without using any extra space. 2

(c) What will be the complexity of the above solution of Q3(a) and Q3(b)? 2

4. (a) Write a program to create a class App add a method for an unsorted list of n elements, find the first element, which is repeated. 2

(b) Add a method to App which take an array of size N, the elements in the array may be repeated. You need to find sum of distinct elements of the array. If there is some value repeated continuously then they should be added once. 2

(c) Create another class ArrApp and invoke the methods created in Q.4(a) and Q.4(b). 2

5. (a) Write a program to create a class Link add a method to Search element in linked list. Given a head pointer and value. Returns 1 if value found in list else returns 0. 2

(b) Add a method to Link which take a linked list and copy the content of linked list in another linked list in reverse order. If the original linked list contains elements in order 1,2,3,4, the new list should contain the elements in order 4,3,2,1. 2

(c) Create another class LinkApp and invoke the methods created in Q.5(a) and Q.5(b). 2

6. (a) Create a static function to insert an element at k^{th} position from the end of linked list. Return true if success and if list is not long enough, then return -1. 2

(b) Create a static function to find the middle element in a singly linked list. 2

(c) Analysis the complexity of the above solution of Q.6(a) and Q.6(b). 2

7. (a) Create a static function of a stack using an array, but the memory of the array needs to be managed. When the stack is full its capacity is doubled. 2

(b) Create another static function when the number of elements fall below capacity/2, the capacity of stack is halved. 2

(c) Invoke the above methods where we do not want to let the capacity of the stack below the initially allocated size. We can define min length when stack is created. 2

8. (a) Create a static function as CircularTour which takes two parameters as there are N number of petrol pumps in a circular path. Each petrol pump has some limited amount of petrol. You are given the amount of petrol each petrol pump has and the distance from next petrol pump. Find if there is a circular tour possible to visit all the petrol pumps. 2

(b) Create a static function as Sliding which takes an array of integer, find maximum value in all the sliding windows of length k. 2

(c) Create a class and invoke the methods created in Q.8(a) and Q.8(b) and write down the output as input for Q. 8(a) is {{8, 6}, {1, 4}, {7, 6}} and Q.8(b) is {11, 2, 75, 92, 59, 90, 55} and k = 3. 2

9. (a) Perform Pre-Order Traversal of binary tree. 2

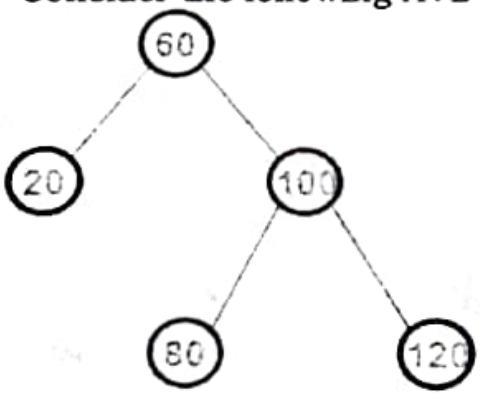
(b) Perform In-Order Traversal of binary tree. 2

(c) Analysis the complexity of above solution. 2

10 (a) Draw the segment tree for input array {1, 3, 5, 7, 9, 11}. And find memory representation of it. 2

(b) Find out the maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0. 2

(c) Consider the following AVL tree. 2



Draw the AVL tree after insertion of node 70?

----All the Best----