

**END SEMESTER EXAMINATION, JULY-2022**  
**Computer Science Workshop-II (CSE 3141)**

Programme: B.Tech(CSE)  
Full Marks: 60

Semester: 4th  
Time: 3 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Analysis algorithm using time and space complexity	L3, L4	Q1, Q3.c, Q4.c	6+2+2
Understanding and effectively use ADT, java collection, sorting and searching	L1, L3	Q2	6
Applying linkedlist, stack, queue on different problem solving	L1, L3, L4	Q5, Q6, Q7, Q8	6+6+6+6
Applying priority queue, graph on problem solving	L1, L3, L4	Q9	6
Understanding algorithm design techniques	L1, L3, L4	Q3a, b, Q4 a, b	4+4
Applying design techniques on problem solving	L1, L3, L4	Q10	6

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

Answer all questions. Each question carries equal mark.

1. (a) 

```
int fun3(int n) {  
    int i, j, m = 0;  
    for (i = 0; i < n; i++) {  
        for (j = 0; j < i; j++) {  
            m += 1;  
        }  
    }  
    return m;  
}
```

2

Find the time complexity



(b) public int factorial(int i) { 2

```
    if (i <= 1) {  
        return 1;  
    }
```

```
    return i * factorial(i - 1);  
}
```

Find the time complexity

(c) Solve the following recurrence relation using Masters Theorem 2  
 $T(n) = 4T(n/2) + n^2$

2. (a) Write a programme to create a class DictionaryApp to store meaning of words, search a word, display the meaning of it and also display the entire dictionary. 2

(b) Add three methods create(), search() and display() to the class and use TreeMap class to create a dictionary of words. 2

(c) Invoke the above created methods from main method. 2

3. (a) Write a programme to find an element using Quick select algorithm. 2

(b) Define a static method quickSelect() which takes array as the argument and the key element to be searched. 2

(c) Find out the time complexity of it. 2

4. (a) Write a programme to find number appeared for odd number of times. Define an array in main method in which all the elements appear even number of times except two, which appear odd number of times. 2

(b) Construct a method to find the elements which appear odd number of times 2

(c) Perform it in  $O(n)$  time complexity and  $O(1)$  space complexity. 2

5. (a) Create a class Student having member variable name, age, mark and required member variable. 2

(b) Create a LinkedList of Student type and perform the below operation on it. 2

(i) Display the list

(ii) Ask the user to enter a student object and print the existence of the object.

(iii) Remove an specified student object

(c) Invoke above methods from main method 2

6. (a) Define a method to detect loop in a single linked list. If there is no loop return 0 other wise return 1. 2



- (b) Define a method to copy the content of single linked list in another linked list in reverse order. 2
- (c) Create a method to sort a single linked list in ascending order. 2
7. (a) Create a palindrome matching method, using stack which ignores characters other than English alphabet and digits. String "Madam, I'm Adam." should return true. 2
- (b) Construct a method to check balanced symbols (such as {}, [], ()) using stack. The closing symbol should be matched with the most recently seen opening symbol. 2
- (c) Construct a method to Reverse elements of a queue using stack. 2
8. (a) Create a class JosephusApp that uses a circular linked list to model Josephus Puzzle. Josephus was one of a group of Jews who were about to be captured by the Romans. Rather than be enslaved, they chose to commit suicide. They arranged themselves in a circle and, starting at a certain person, started counting off around the circle. Every nth person had to leave the circle and commit suicide. Josephus decided he didn't want to die, so he arranged the rules so he would be the last person left. 2
- (b) Define a method Josephus with arguments: number of people in the circle, the number used for counting off, and the number of the person where counting starts (usually 1). 2
- (c) Invoke the method from main. The output is the list of persons being eliminated. When a person drops out of the circle, counting starts again from the person who was on his left (assuming you go around clockwise). Here is an example. There are seven people numbered 1 through 7, and you start at 1 and count off by threes. People will be eliminated in the order 4, 1, 6, 5, 7, 3. Number 2 will be left. 2
9. (a) Write a programme to create a Binary Search Tree (BST). 2
- (b) Traverse the BST to display the elements in ascending order. 2
- (c) Find and display the In-Order Successor node of root node. 2
10. (a) What do you mean by height balanced tree? 2
- (b) Construct an AVL Tree by inserting the following elements in the given order. 2  
65, 10, 20, 28, 19, 109, 100, 82  
(Represent it in diagram only)
- (c) Find out how many Left rotations and right rotations are required to make it balanced. 2

\*End of Questions\*