

END SEMESTER EXAMINATION, JULY-2022 DATA STRUCTURE AND ALGORITHMS (CSE 2001)

Programme: B.Tech
Full Marks: 60

Semester: 2nd
Time: 3 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Able to state and explain basic programming syntax, semantics, and building blocks.	L1	1(c), 4(a)	4
Able to develop java programs using the programming constructs like conditional statements, looping, arrays, methods and classes.	L2	2(b,c), 3(a,b,c), 4(b,c), 5(a,b,c)	20
Able to analyze, debug and test the programs and correctly predict their outputs.	L4	2(a), 1(a,b), 7(a), 8(c), 9(a)	12
Able to differentiate the behaviors of different data structures and their memory representation.	L3	8(b), 9(b,c)	6
Able to choose the appropriate data structures that efficiently model the problem of interest.	L5	6(a,b,c), 7(b,c), 8(a), 10(b)	14
Able to apply advanced programming techniques for developing solutions of different programs.	L3, L4	10(a,c)	4

*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) Find the output or error of the following code snippet. Justify your answer. Eliminate typographical error. 2

```
int x=5,y=4;
System.out.println(++x^y--|(x=y&1100));
```


- (b) Find the output or error of the following code snippet. Justify your answer. Eliminate typographical error. 2

```
interface foo
{
    foo() { }
}
public class test
{
    public static void main(String[] args)
    {
        System.out.println("foo");
    }
}
```

- (c) Consider the statement P and Q below and find which is TRUE/FALSE with justification. 2

P : Every class containing abstract methods must be declared abstract.

Q : Abstract class defines only the structure of the class not its implementation.

2. (a) What is the time complexity of the insertion operation in a linear queue? Justify your answer. 2

- (b) Write a java method to count positive, negative and zero in an integer array. The method prototype is given below. 2

public static void count_PNZ(int a[])

- (c) Create a class Point with instance variables x, y to represent co-ordinates of point having instance method *setPoint()* and *display_points()*. 2

3. (a) From Question no. 2(c), write a Java method to find distance between two points. The prototype of the *findDistance* method is given below: 2

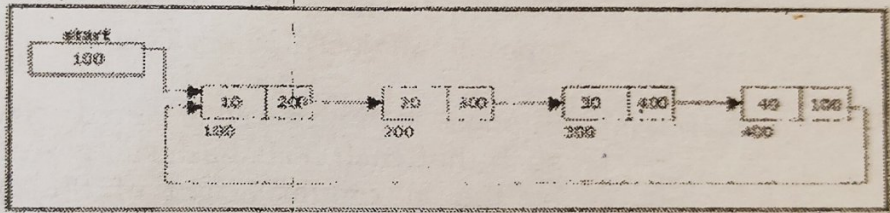
public static void findDistance(Point, Point)

- (b) Create an interface *Department* containing *getdeptname()* and *getdeptHead()*. Create another class *Hostel* containing instance member *hostel_name* and *room_no* containing method *get_hostel_name()* and *get_room_no()*. 2

- (c) Create a class *Student* which is inherited from *Department* and *Hostel* containing instance members *student_name* and *regd_no* and instance method *setdata()* and *display()*. Print the student details, department and hostel details of a student. 2

4. (a) Differentiate between Stack and Queue with examples. 2

- (b) Create a class Employee & enter salary, name of the employee. If salary is less than equal to zero, create an exception *salaryException* & throw it using Java 2

- (c) Design a package that contains two classes *Employee* & *Test*. The *Employee* class has data members as *ename*, *eid* and instance methods *input()* & *output()*. Similarly the *Test* class has data members as *salary*, *bonus* and instance methods *input()*, *output()*, *Employee* is extended by *Test*. Another package carry interface *Sports* with 2 attributes *score1*, *score2*. Find *grand total salary* & *score* in another class. 2
5. (a) Write a java method using Generics to count the occurrence of an element in an array of any type. The signature of count method is given below. 2
`public static int count(T[] array, T item)`
- (b) Write a recursive java method that takes a character string *S* and output its reverse. For example, the reverse of 'pots&pans' would be 'snap&stop'. 2
- (c) Write a java method to search an item in single linked list. If item found print "Search is Successful" otherwise print "Search is Unsuccessful". The prototype for search method is given below: 2
`public static void search(Node start, int item)`
6. (a) Write a java method to insert a node at the end of double linked list. 2
- (b) 2
- 
- Write the java statements to count number of nodes present in the above given linked list.
- (c) Write a java method to delete a node from the beginning of a single Linked list. 2
7. (a) In an array implementation of linear queue what is value of FRONT and REAR after the following operations. (Maximum size of queue is MAX=5). insert(1), insert(10), insert(22), insert(89), insert(66), insert(7), delete(), delete(), insert(55). Show the steps. 2
- (b) Write a java method to DELETE an element from the queue. The prototype of DELETE operation is given below. 2
`public static void DELETE (int QUEUE [], int FRONT, int REAR)`
- (c) Evaluate the given postfix expression. Also find its corresponding Infix expression. 2
 Postfix Expression: 6 3 2 4 + - *
8. (a) Convert the given Infix expression to Postfix expression using Stack. 2
 $P + T * Z + (A * B + C) ^ L$

- (b) Write a java method to PUSH an element into the stack. The prototype of PUSH operation is given below.

public static void PUSH (int stack [], int top, int item)

- (c) A Circular queue of size 5764 with FRONT value 4587 and REAR value 1265. Find the total number of elements present in the circular queue?
- 9 (a) In a circular queue of size 10, value of FRONT is 9 and REAR is 0, what will be the value of FRONT and REAR after deleting two elements. Show through picture.

- (b) From the given figure in question no. 10(c) check whether it is a Binary search tree (BST) or not. If not then keep the root node 14 as fix and re-arrange the nodes in such a way that it will be a BST.

(c)

P	H	U		T	M	D					L		Z
0	1	2	3	4	5	6	7	8	9	10	11	12	13

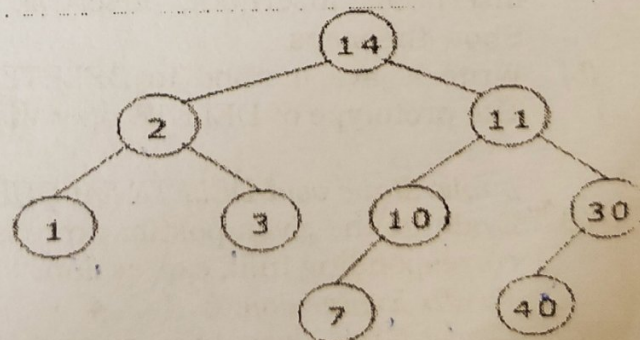
Find the linked list representation from the above array representation of a Binary Tree.

- 10 (a) Suppose a Binary tree is constructed with n number of nodes, such that each node has exactly zero or two children. What will be the maximum height of the Binary tree? Validate your answer with examples.

- (b) Pre-order: Z, M, S, K, A, B, P, C
In-order: M, K, S, B, A, Z, C, P

From the above given traversal find the Post-order traversal of the Binary tree.

- (c) Find Post-order and In-order of the below given tree.



End of Questions

5764
4587

1277
1265

42

0 1 2 3 4 5
12 4 1 1 1 2

F=4
R=1
6-4=2+2+1
max=6
4587
0 1 2 3 4
12 1 1 1 2
flow 4
rear=