



**Computer Department**

**Data structure sand their algorithms / Final exam / 5<sup>th</sup> sem / Spring 2019**  
**Instructor : Mohamed AL ferjani 2 hours 22-09-2019**

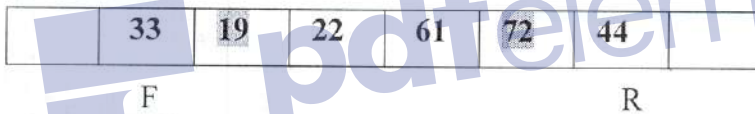
Name : ..... ID : .....

**Note : Clear and organized answers help for fair assessment.**

**Part one : answer only 7 questions ... each = 5 marks**

- 1- Name 3 of dynamic data structures and name 3 of important algorithms you have studied in this course.
- 2- Compare between Stack and Queue structures, and give 3 applications for each one.
- 3- Suppose you have a full binary tree , and the result of **Pre order** traverse was : **A B D C E G F H K M O P Z Y X**. Draw the structure of this binary tree.
- 4- Given a static circular queue as shown below, explain with drawing the result of applying these operations :

**Insert 12 – insert 15 – delete – insert 24 – insert 55 – delete – insert 99**



- 5- Given a double linked list named LIST9, Write an algorithm of deleting the last node of the list (if exist).
- 6- The idea of " **Left child .. Right siblings**" is applied in the algorithm of constructing :  
A) Binary tree    B) Un-directed graph    C) General tree    D) Binary search tree
- 7- The time complexity ( Big Oh) of : -Binary search algorithm is : .....  
- Depth – first traverse is : ..... -Dykstra algorithm is : ..... – Heap sort is: .....
- 8- Explain the Post-fix Evaluation algorithm (using stack), then apply it to find the result of the following expression : **5 3 2 + \* 100 / .**
- 9-
  - a) Draw the Graph structure which represent the given **adjacency matrix**.
  - b) Redraw the presentation of the given Graph by using **Linked lists**.

0	1	0	1	1
1	0	1	0	0
0	1	0	1	1
1	0	1	0	0
1	0	1	0	0



**Part two : answer only 2 questions ... each = 15 marks**

Q1- The following iterative code prints out the given shape with time complexity (Big Oh) =  $O(n^2)$ .

a) Design **new iterative algorithm** (code) to do same task with better time complexity.

b) Design **new recursive algorithm** to do same task.

```
n=6;
for ( i = 1; i<n ; ++i)
begin
for ( j=1;j<=n;++j)
write( " * " );
write( newline );
end;
```

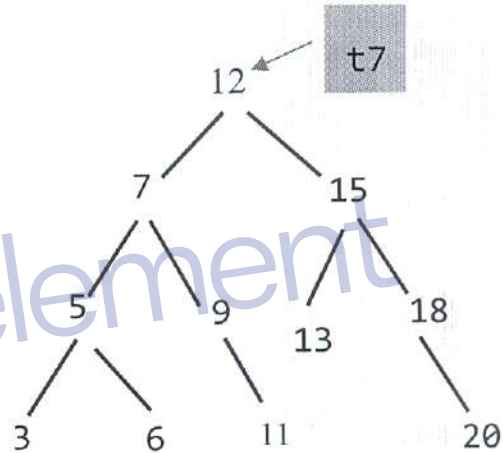
```
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
```

Q2- Check the given Binary search tree t7, then :

- a) Find the tree traverse by :
  - Pre order traverse.
  - In order traverse.
  - Post order traverse.

b) Complete the following iterative function which find the smallest item in a BST t7.

```
BinaryNode * findMin( BinaryNode *t7
)
{
if( ..... != nullptr )
while( t7->right != ..... )
t7 = .....;
return .....;
}
```



Q3- Write an algorithm using Stack structure to read infix arithmetic expression and then check for balance of parentheses. ( consider special cases ).

**Part three : answer 2 questions ... each = 15 marks**

Q1- The idea of Bubble sort algorithm is to start from the first element, then compare any two adjacent elements up to the last element and make a swap when necessary, repeat this process many passes reducing the size of the list in each pass, until you finish the list.

- a) Write the algorithm code in ascending sort .
- b) Implement the algorithm with detailed illustration steps on the list : **7, 25, 11, 9, 4**

Q2- given a doubly linked list headed by List5 containing **sorted integer** numbers.

Design an algorithm to remove duplicate numbers and keep only the original ones.

Ex :

