

MAR 30 2017

Level : B. E./B.Sc.  
Year : IICourse : COMP 202  
Semester : I

Exam Roll No. : Time : 30 mins.

F. M. : 10

Registration No. :

Date :

## SECTION "A"

[20 Q.  $\times$  0.5 = 10 marks]

Circle the most appropriate answer.

1. Find the odd one out:  $O(n)$ ,  $O(n^2)$ ,  $O(n^3)$ ,  $O(3^n)$   
a.  $O(n)$                       b.  $O(n^2)$                       c.  $O(n^3)$                       d.  $O(3^n)$
2. What is the time complexity of the following code?  
for ( i = 0; i < n; i++)  
  a[ i ] = 0;  
for(i=0; i<n; i++)  
  for(j = 0; j < n; j++)  
    a[ i ] += a[ j ] + i + j;  
a.  $O(n)$                       b.  $O(n^2)$                       c.  $O( n \log n)$                       d.  $O(n^3)$
3. Four algorithms A1, A2, A3, A4 solve a problem in the order  $\log(n)$ ,  $\log \log(n)$ ,  $n \log(n)$  and  $n$  respectively. Which is the best algorithm?  
a. A1                      b. A2                      c. A3                      d. A4
4. Depth of a binary tree with  $n$  nodes is:  
a.  $\log(n + 1) - 1$                       b.  $\log n$                       c.  $\log(n - 1) * (n - 1)$                       d.  $\log(n) + 1$
5. Binary search tree has the best case run-time complexity of  $O(\log n)$ . What could be the worst case?  
a.  $O(n)$                       b.  $O(n^2)$                       c.  $O(n^3)$                       d. None of the above
6. The maximum number of nodes in a binary tree of depth  $k$  is:  
a.  $2^{k-1}$                       b.  $2^{k+1} - 1$                       c.  $2^k - 1$                       d.  $2^{k+1} + 1$
7. The number of elements in an ARRAY[ $l_1 : u_1, l_2 : u_2$ ] is given by:  
a.  $(u_1 - l_1 - 1) (u_2 - l_2 - 1)$                       b.  $(u_1 * u_2)$   
c.  $(u_1 - l_1) (u_2 - l_2)$                       d.  $(u_1 - l_1 + 1) (u_2 - l_2 + 1)$
8. For the array, A[ $l_1 : u_1, l_2 : u_2$ ] where  $\alpha$  is the base address, A[ $i, l_2$ ] has its address given by:  
a.  $(i - 1)u_2$                       b.  $\alpha + (i - 1) u_2$                       c.  $\alpha + i * u_2$                       d.  $\alpha + (i - 1) * u_1$
9. Which of the following will be the postfix expression for the given infix expression:  
 $((C + (D * E)) - F)$   
a. CDE\*+F-                      b. CDE+\*F-                      c. CDF\*+E-                      d. DCF\*+E-
10. The equivalent postfix expression for the infix expression  $a + b + c$  is:  
a. abc++                      b. ab+c+                      c. ab+++c                      d. a++bc



Level : B. E./B.Sc.  
Year : II  
Time : 2 hrs. 30 mins.

Course : COMP 202  
Semester : I  
F. M. : 40

SECTION "B"  
[6Q. × 4 = 24 marks]

Attempt ANY SIX questions of the following.

1. Arrange the following expressions from slowest to fastest growth rate. Provide justifications for your arrangement.  
 $n \log_2 n$   $4^n$   $k \log_2 n$   $5n^2$   $40 \log_2 n$   $\log_4 n$   $12n^6$
2. Analyze the time complexity of the following programs. [2+2]
  - a) 

```
for send = 1 to n do
  for receive = 1 to send do
    for ack = 2 to receive do
      message = send - (receive + ack);
    end
  end
end
```
  - b) 

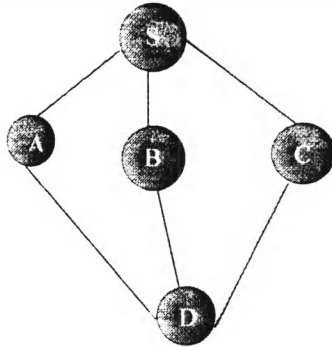
```
sum = 0;
i = n;
while (i > 0)
{
  sum += i;
  i = i/2;
}
```
3. Explain the insertion sort algorithm and discuss the best case and worst case time complexities. Explain the time complexities with the suitable case scenarios.
4. Illustrate the application of a stack to convert the infix expression  $A + B * C$  to postfix.
5. Hand execute the following code and show the contents of the resulting queue:

```
values = Queue()
for (i = 0; i < 16; i++)
{
  if i mod 3 == 0
  {
    values.enqueue(i);
  }
  else if (i mod 4 == 0)
  {
    values.dequeue();
  }
}
```
6. Apply mergesort algorithm to sort the given sequence of keys (80, 7, 24, 16, 43, 91, 35, 2, 19, 72). Write the pseudocode of mergesort algorithm.
7. Consider the following set of values and use them to build a heap by adding one value at a time in the order listed:  
30 63 2 89 16 24 19 52 27 9 4 45  
(a) min-heap (b) max-heap

SECTION "C"  
[2Q. × 8 = 16 marks]

Attempt *ANY TWO* questions of the following.

8. Given input { 4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function  $h(x) = x \bmod 10$ , show the resulting: [2+2+4]
- Separate chaining hash table
  - Open addressing hash table using linear probing
  - What is rehashing? How does it serve to overcome the drawbacks of linear probing?
9. Given the graph below, illustrate Depth First Search (DFS) and Breadth First Search(BFS) traversal algorithms to show the order of the vertices visited. What are minimum spanning trees and their applications? [2+2+4]



10. Differentiate between binary search and linear search algorithms. Write the iterative and recursive versions of the binary search algorithm. Discuss the time complexities of linear and binary search. [2+4+2]