Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.TECH (CSE)/SEM-1/MCSE-104/2011-12

2011

ADVANCED ALGORITHMS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

Answer the following questions :

1. Solve the following recurrence : $T(n) = 2T(\sqrt{n}) + \log_2 (n)$ 5

2. What is an optimal Huffman code for the following set of frequencies, based on the first 8 Fibonacci numbers ?

   [a : 1 b : 1 c : 2 d : 3 e : 5 f : 8 g : 13 h : 21] 5

3. Write the KMP algorithm for string matching with proper explanation. 5

4. Find the longest common sub-sequence of the following two sequences S_1 = *BDCABA* and S_2 = *ABCBDAB,* using dynamic programming. 5

5. Write down the recurrence relation for finding the nth Fibonacci number by dynamic programming and then solve it to prove that the time complexity of the algorithm is $O(\phi^n)$, where ϕ is the divine ratio. 5

6. Design a backtracking algorithm to solve the n-queens problem. 5

7. Explain whether the following 15-puzzle problem can be solved or not : 5

1	2	3	4
5	6	10	8
7		11	9
14	13	15	12

GROUP – B

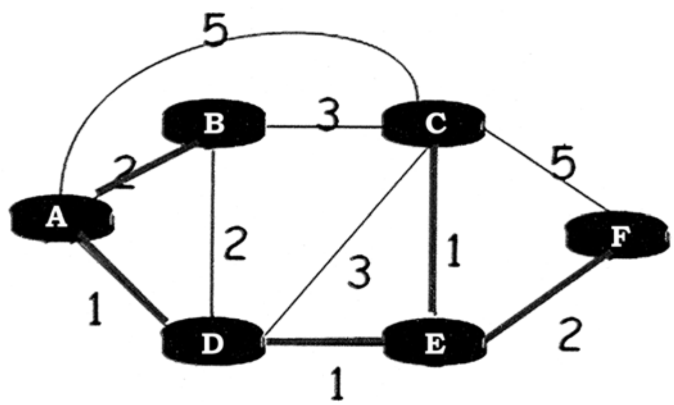
Answer the following questions :

8. For the following tail-recursive method find out the corresponding iterative method. 5

```
int fact_aux (int n, int result)
{
if (n == 1) return result;
return fact_aux(n – 1, n * result) ;
}
```

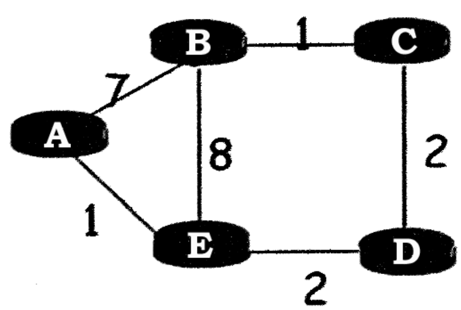
9. Find an iterative solution of Tower of Hanoi problem by writing small code snippet. Test your procedure by executing a dry run with number of disks = 3 5

10.



Starting from node A, find all pair shortest paths using Dijkstra's Algorithm with proper explanation. 5

11.



Find the distance table and corresponding routing table with proper explanation using distance vector algorithm for source node E. 5

12. Explain the matrix chain multiplication technique for the following matrix chain ($A_1A_2A_3A_4$) where, 8

$A_1 : 3 \times 5$, $A_2 : 5 \times 8$, $A_3 : 8 \times 2$, $A_4 : 2 \times 6$

13. Find the minimum cost path starting from vertex 1 of a travelling salesperson in the following graph. 7