# NEW

# 2015

## BCA

## 3rd Semester Examination

## DESIGN AND ANALYSIS OF ALGORITHM

### PAPER—2101

*Full Marks : 70*

*Time :* 3 Hours

*The figures in the right-hand margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

Answer *Question no. 1* and any *four* from the rest.

**1.** Answer any *five* questions : 5×2

(a) Show that, $7n^2 - 5n = \theta(n^2)$.

(b) Define Tower of hanoi problem.

(c) Write a procedure for in-order traversal of a binary tree.

(d) What is NP-Completeness ? Explain.

(e) What do you mean by 'lower bound' of a problem ?

(f) What do you mean by average case and worst case time complexities ?

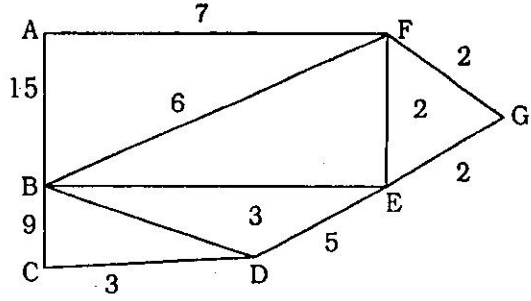
(g) What are the time and space complexities of the linear search algorithm ?

**2.** (a) Explain the basic principle of divide-and-conquer method. 6

(b) Write a divide-and-conquer method to find the sum of n elements. Also, find its time complexity. 6+3

**3.** (a) What is minimum spanning tree ? 2

(b) Write down Prim's algorithm to find MST of a graph. Use the same technique to find MST of the following graph given in fig.1. 5+5



(c) What is backtracking? 3

**4.** (a) Show that the solution of

$$T(x) = T\left(\left\lceil x/2 \right\rceil\right) + 1 \text{ is } O(\log_2 x)$$

(b) Write binary search algorithm. Find the best case, average case and worst case time complexities. What are the merits and demerits of this algorithm? 5+(4+3+3)

**5.** (a) What is dynamic programming? Explain matrix-chain multiplication problem using dynamic programming. 4+6

(b) What are the differences between dynamic programming & greedy algorithm. 5

**6.** (a) What is Hamiltonian cycle?

(b) Write an algorithm to swap between two numbers?

(c) Write Dijkstra's shortest path algorithm and explain with example? 2+6+(4+3)

**7.** (a) Show that any connected, undirected graph G=(V, E) satisfies $|E| \geq |V| - 1$. 8

(b) Show by induction that the number of degree 2 nodes in any binary tree is 1. 7

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