G 1401 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Computer Science and Engineering / Information Technology

CS 010 601 / IT 010 605—DESIGN AND ANALYSIS OF ALGORITHMS (CS, IT)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What is an algorithm ? Give its properties.
2. Derive the complexity of bubble sort algorithm.
3. Define travelling salesman problem.
4. What is least-cost branch and bound method ?
5. Give a simple string-matching algorithm.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Define Theta notation. Give an example :

   I_S $2^{n+1} \in O(2^n)$? Justify.

7. Give the randomised version of quick sort.
8. What is the loop invariant in Kruskal's algorithm ?
9. Find an optimal solution to the Knapsack problem :

   Using greedy strategy :

   $n = 7, w = 15$

   $(P_1, P_2 \ldots P_7) = (10, 5, 15, 7, 6, 18, 3)$ and

   $(w_1, w_2 \ldots w_7) = (2, 3, 5, 7, 1, 4, 1)$.

10. What is Vertex-cover problem ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Find the complexity of linear search algorithm. (3 marks)

(b) What is a recurrence relation ? Construct a recursion-tree for the recurrence

$T(n) = 2T(n/2) + cm.$

(5 marks)

(c) Using Master's Theorem solve :

$T(n) = 2T(n/2) + n^3.$

(4 marks)

Or

12. Explain the algorithm for heapsort. Derive its complexity.

13. Explain the algorithm for finding maximum and minimum, and analyze its time complexity.

Or

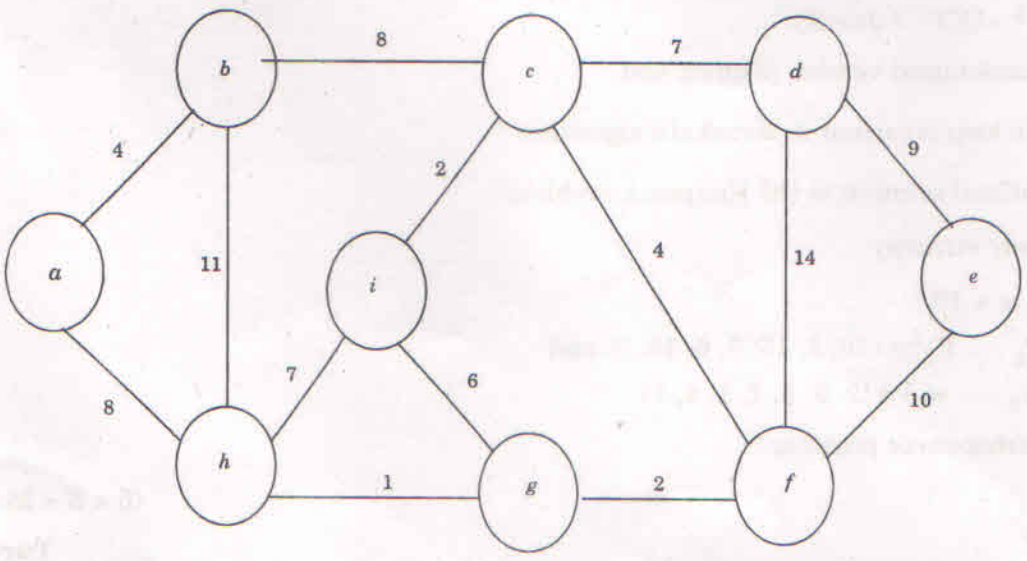
14. What is divide and conquer method ? How can recurrence be used as a solution for divide and conquer method ?

Apply divide and conquer to merge sort.

15. Using dynamic programming, derive a solution for the travelling salesman problem and analyze its complexity.

Or

16. Execute Prim's algorithm on the graph below and get a MST.



17. How to solve the sum of subset problem and derive its time complexity ?

Or

18. (a) Explain generating function and bounding function. (6 marks)

(b) Compare branch and bound and backtracking. (6 marks)

19. Prove that any algorithm that works by comparing keys to find the second largest from a set of n keys must do atleast $n + \log n - 2$ comparisons in the worst case.

Or

20. (a) Write short notes on planar graph coloring problem. (6 marks)

(b) How can you find the connected components of a graph ? (6 marks)

[5 × 12 = 60 marks]