SG – 641

VI Semester B.C.A. Degree Examination, September/October 2021
(Y2K8 Scheme)
COMPUTER SCIENCE
BCA 601 : Design and Analysis of Algorithms

Time : 3 Hours Max. Marks : 90/100

Instructions : *1) Section **A, B, C** are common to **all**.*
*2) Section **D** is applicable to the students who have taken admission in **2013-2014**.*
*3) **100** marks for students of **2013-14** onwards and **90** marks for repeaters prior to **2013-14**.*

SECTION – A

I. Answer **any ten** questions. **Each** carries **two** marks : **(10×2=20)**

1) Define time complexity of an algorithm.

2) Define (Big-Oh) O-notation.

3) Write the time complexities of
   i) Linear search
   ii) Quicksort.

4) Write the control abstraction of divide and conquer.

5) Define the terms :
   i) Spanning tree
   ii) Minimum cost spanning tree.

6) Mention two ways of representation of graphs.

7) What is an optimal solution ?

8) Define the term related to graphs
   i) Adjacent vertex
   ii) Degree of a vertex.

9) What is dynamic programming ?

P.T.O.

10) State the N-Queens problem.

11) What is backtracking ?

12) State the graph coloring problem.

SECTION – B

II. Answer **any five** questions. **Each** carries **five** marks : **(5×5=25)**

13) Explain various basic efficiency classes of algorithms.

14) Write binary search algorithm.

15) Solve the following recurrence relation :

$$T(n) = 2T\left(\frac{n}{2}\right) + 2,\ T(2) = 1,\ T(1) = 0.$$

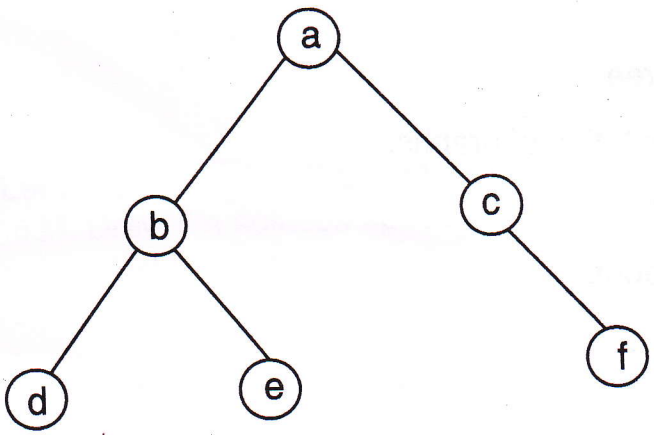
16) Write Prim's algorithm for obtaining minimum cost spanning tree.

17) Write Floyd's algorithm and analyze its time complexity.

18) Differentiate between dynamic programming and divide and conquer techniques.

19) Explain subset sum problem with suitable example.

20) Write recursive post order tree traversal algorithm and traverse the following tree.



SECTION – C

III. Answer **any three** questions. **Each** carries **fifteen** marks : **(3×15=45)**

21) a) Design an algorithm to obtain maximum of N elements and obtain the time complexity. **7**

b) Solve 4-Queens problem using backtracking. **8**

22) a) Write recursive maxmin algorithm to find maximum and minimum in a set of N elements. **8**

b) Trace the maxmin algorithm for the following set. **7**

32 74 –16 –28 99 10 25 –7 68

23) a) Explain greedy strategy with control abstraction. **7**

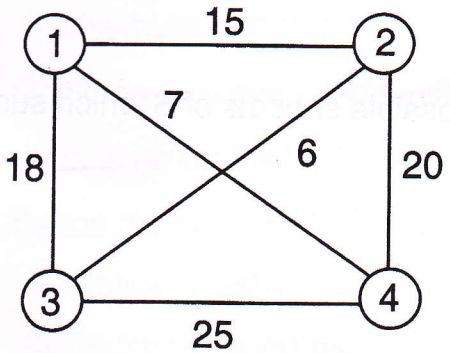
b) Solve the fractional knapsack problem for an optimal solution. Also compute the maximum profit earned. **8**

Weights $(w_1, w_2, w_3, w_4, w_5) = (5, 2, 4, 9, 1)$

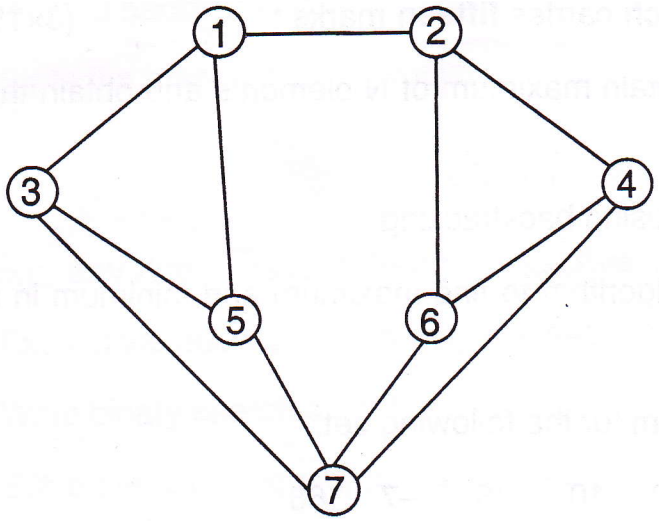
Profits $(p_1, p_2, p_3, p_4, p_5) = (10, 6, 28, 18, 4)$

Knapsack capacity W = 15.

24) State Travelling Salesperson Problem (TSP). Find the minimum cost tour in the following graph. **15**



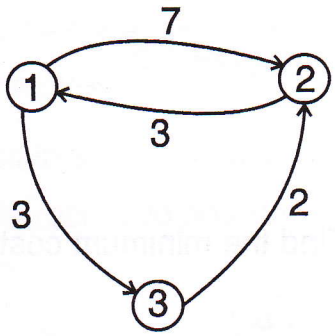
25) Explain DFS algorithm and draw the DFS spanning tree for the following graph. **15**



SECTION – D

IV. Answer **any one** question, question carries **ten** marks : **(1×10=10)**

26) Determine all pair's shortest paths in the following graph.



27) Let S = {5, 6, 7, 8, 10} and M = 15 find all possible subsets of S which sum to M. Draw the solution space tree.