SARDAR PATEL UNIVERSITY
Master of Computer Applications (MCA)
Semester – III External Examinations
PS03CMCA04 – Analysis and Design of Algorithms
Saturday, 24th November, 2018

Time: 02:00 p.m. to 05:00 p.m.   Max Marks: 70

Q1. Choose the most appropriate option for each question.   [8]

i. ___ Pseudo code notation is used to indicate assignment statement, while writing algorithm.
   (A) =   (C) ==
   (B) :=   (D) All of these

ii. While measuring performance of an algorithm, the space and time needed for compilation is __
   (A) Not considered   (C) Considered
   (B) Optional   (D) Averaged

iii. Knapsack problem fits in the category of __.
   (A) Ordering Paradigm   (C) Both (A) & (B)
   (B) Subset Paradigm   (D) None of these

iv. ____is a Boolean valued function that determines whether x can be included into the solution or not, in greedy method.
   (A) Select   (C) Project
   (B) Union   (D) Feasible

v. Tree organizations which are problem instance dependent are called _____.
   (A) Hybrid trees   (C) Dynamic trees
   (B) Static trees   (D) None of these

vi. _____ is a generated node which is to be expanded further.
   (A) Dead node   (C) Live node
   (B) E-node   (D) None of these

vii. _____ are those problem states s for which the path from the root to s defines tuple in the solution space.
   (A) Answer states   (C) Both (A) & (B)
   (B) Solution states   (D) None of these

viii. _____ are rules that restrict each xi to take on values only from a given set.
   (A) Implicit Constraints   (C) Both (A) & (B)
   (B) Explicit constraints   (D) None of these

Q2. Answer the following questions (Any Seven):   [14]
a. List types of recursive algorithms.
b. What is space complexity of an algorithm? Which are two components of it?
c. Briefly explain the concept of tree.
d. Compare Heapify and Insert algorithms briefly.
e. What do you mean by "Feasible Solution" of a problem?
f. Define: Principle of Optimality.
g. Give an example of sum of subset problem.
h. What is Hamiltonian cycle? Give an example.

(P.T.O.)

i. What is 0/1 Knapsack problem?

Q3. Answer the following questions:
a. What is Algorithm? Explain criteria to design an algorithm. [6]
b. What is asymptotic notation? Define all asymptotic notations; explain any one of them in detail. [6]

OR

b. Write an algorithm for finding maximum and minimum element in given set using divide and conquer method. [6]

Q4. Answer the following questions:
a. Explain the knapsack problem in detail. Write the algorithm to solve this problem. [6]
b. Find the minimum cost spanning tree for following graph G, using Prim's method. Show all intermediate steps. [6]
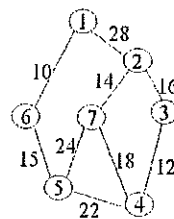
OR

b. Explain the logic of Dijkstra's algorithm. Show the execution of Dijkstra's algorithm by giving example of your choice. [6]

Q5. Answer the following questions:
a. Write an algorithm of multistage graph problem (Forward approach). Explain it taking suitable example. [6]
b. Explain n-queens problem taking suitable examples. [6]

OR

b. Write algorithm of Hamiltonian cycle problem. Explain it taking suitable example. [6]

Q6. Answer the following questions:
a. Write and explain an algorithm of Least Cost search. [6]
b. Explain the 15-puzzle problem taking suitable example. [6]

OR

b. Consider the travelling salesperson instance defined by the following cost matrix: [6]

$$\begin{bmatrix} \infty & 8 & 3 \\ 7 & \infty & 5 \\ 4 & 6 & \infty \end{bmatrix}$$

(i) Obtain the reduced cost matrix.
(ii) Generate its state space tree using Least Cost Branch-and-Bound.