

40/A-43

SEAT No. \_\_\_\_\_

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**SARDAR PATEL UNIVERSITY**  
**Master of Computer Applications (MCA)**  
**Semester – III External Examinations**  
**PS03CMCA04 – Analysis and Design of Algorithms**  
**11<sup>th</sup> April, 2019, Thursday**

Time: 02:00 p.m. to 05:00 p.m.

Max Marks: 70

**Q1. Choose the most appropriate option for each question.**

**[8]**

- i. Which of the following can be used with Find operations efficiently?  
(A) Merge Rule (C) Collapsing Rule  
(B) Search Rule (D) None of these
- ii. The \_\_\_\_\_ asymptotic notation is used to represent the maximum time required for the completion of execution of an algorithm.  
(A) Big-Oh (C) Omega  
(B) Theta (D) None of these
- iii. Optimal Storage on Tapes problem fits into \_\_\_\_  
(A) Subset Paradigm (C) Ordering Paradigm  
(B) Sorting Paradigm (D) All of these
- iv. The data structure that supports the operation of search min (or max), insert and delete min (or max) is called a \_\_\_\_\_.  
(A) Priority Queue (C) Both (A) & (B)  
(B) Heap (D) None of these
- v. Tree organizations which are problem instance independent are called \_\_\_\_\_.  
(A) Dynamic trees (C) Both (A) & (B)  
(B) Hybrid trees (D) None of these
- vi. \_\_\_\_\_ is a generated node which is not to be expanded further.  
(A) Live node (C) Dead 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) Solution states (C) Both (A) & (B)  
(B) Answer states (D) None of these
- viii. \_\_\_\_\_ are rules that do not restrict each  $x_i$  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. Differentiate: Heapify and Insert.
- b. What is time complexity?
- c. Prove:  $3n + 2 = \Omega(n)$
- d. What is main idea of greedy methods?

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(P.T.O)

- e. What is Knapsack problem?
- f. Discuss principal of optimality with an example.
- g. Define: n-queens problem. Give an example.
- h. What is Optimal binary Search Tree?
- i. Explain graph coloring problem.

**Q3. Answer the following questions:**

- a. Explain the term algorithm. How can one judge an algorithm in various aspects?. [6]
- b. What is binary tree? Explain the method of representing binary tree as an array. [6]

**OR**

- b. Write Heapify algorithm. [6]

**Q4. Answer the following questions:**

- a. Explain the measures on the basis of which one can decide which object to be selected next in knapsack problem. [6]
- b. Discuss the Prim's method for finding the minimum cost spanning tree. Also show proper example. [6]

**OR**

- b. Explain single source shortest path problem by giving suitable example. [6]

**Q5. Answer the following questions:**

- a. Write an algorithm of multistage graph problem (Backward approach). Explain it taking suitable example. [6]
- b. Write algorithm of Hamiltonian cycle problem. Explain it taking suitable example. [6]

**OR**

- b. Write algorithm of graph coloring problem. Explain it taking suitable example. [6]

**Q6. Answer the following questions:**

- a. Discuss Least Cost search in detail taking suitable examples. [6]
- b. Explain the 15-puzzle problem taking example of DFS approach. [6]

**OR**

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

$$\begin{pmatrix} \infty & 4 & 2 \\ 7 & \infty & 9 \\ 1 & 2 & \infty \end{pmatrix}$$

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

