Seat Number

# Analysis & Design of Algorithms
## (Only Computer Branch) (176115)

**P. Pages : 2**

**Time : Three Hours** **Max. Marks : 80**

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Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub-questions from each unit.
5. Figures to the right indicates full marks.

### UNIT - I

1. a) Define algorithm and explain the criteria it must satisfy? **8**

   b) Analyze the time complexity of insertion sort for its best and worst case. **8**

   c) i) Solve the recurrence equation $T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$. **4**

   ii) For the following program give big oh analysis of the running time (in terms of n) **4**
      for (i = 0; i < n; i++)
      A [ i ] = +;

### UNIT - II

2. a) Using Merge sort algorithm to sort the following elements 15, 10, 5, 20, 25, 30, 40, 35 and analyze its time complexity. **8**

   b) Write and analyze the quick sort algorithm for its best and worst case using suitable example. **8**

   c) Explain timing problem and analyze its cost and randomized version of it. **8**

### UNIT - III

3. a) Draw state space tree for 4 queens problem and find two solutions of it. **8**

b) Apply branch and bound technique to solve travelling Salesman Problem whose Matrix is **8**

$$\begin{bmatrix} \infty & 7 & 3 & 12 & 8 \\ 3 & \infty & 6 & 14 & 9 \\ 5 & 8 & \infty & 6 & 18 \\ 9 & 3 & 5 & \infty & 11 \\ 18 & 14 & 9 & 8 & \infty \end{bmatrix}$$

c) Consider three items along with their respective weights and values as $w = \{5, 4, 3\}$ $v = \{6, 5, 4\}$ maximum capacity = 7 Pack this Knapsack using branch and bound technique so as to give maximum possible value while considering all constraints. **8**

## UNIT - IV

**4.** a) Find an optimal Huffman code for the following set of frequencies. **8**
a:50  b=25  c=15  d=40  e=75.

b) Solve the Multistage graph. **8**
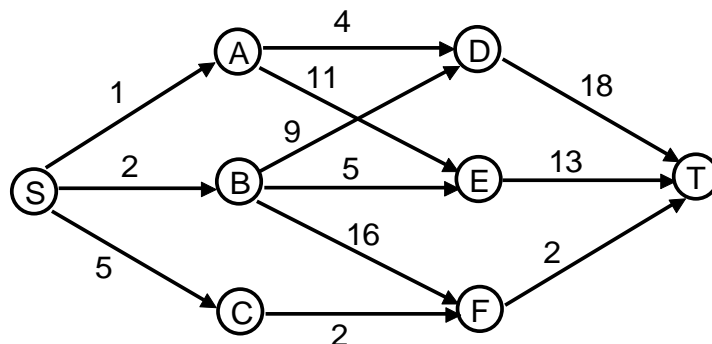


c) Find the optimal solution for 0/1 Knapsack problem **8**
(w1, w2, w3, w4) = (10, 15, 6, 9) (P1, P2, P3, P4) = (2, 5, 8, 1) and M = 30

## UNIT - V

**5.** a) Write short note on : **8**
1) NP hard problem
2) NP complete problem

b) Explain approximation algorithm with appropriate example. **8**

c) Explain zero - one principle. **8**

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