

Indian Institute of Technology Delhi

MAL 760 Advanced Algorithms

Major Test

Weightage: 40% Time: 3.30 P.M. 5.30 P.M.

Date: 3. 4.07

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- Q1. Propose an approximation algorithm for set cover problem based on rounding. Prove the approximation ratio. [5]
- Q2. Suggest a FPTAS for knapsack problem using dynamic programming technique. Prove your claim. [8]
- Q3. Design a 2-approximation algorithm for weighted vertex cover problem. Prove that your algorithm achieves the approximation ratio of 2. (No mark will be awarded if you are unable to prove the approximation guarantee). [5]
- Q4. Show how the Primal dual based approximation algorithm runs in polynomial time even if the LP relaxation contains exponential number of constraints. Illustrate this using the LP-relaxation of the s-t shortest path problem in an undirected graph. [5]
- Q5. Prove that the general TSP does not admit a c-approximation algorithm for any constant $C > 0$ unless $P=NP$. Can the proof of the above go through if c is replaced by $\log n$, where n is the number of vertices of G? [5]
- Q6. Design a factor 2 approximation algorithm for minimum cardinality maximum matching problem. [5]
- Q7. Give an algorithm to color a graph G with $\Delta(G)+1$ colors. Use this to color a 3-colorable graph G with $O(\sqrt{n})$ colors. [3+4]
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