



Quiz 02 for MT3444: Combinatorial Optimization

Date: 30th March 2026 (Monday) Time: 12:00pm – 01:00pm (1 hour)

Number of questions: 2; Maximum number of points: 15

1. (a) Define NP-Optimization problem. Clearly specify the four different component of the definition and illustrate them with the VERTEX COVER problem. 3
- (b) State and prove the complementary slackness conditions for a minimization linear program. 3

2. (a) Consider an instance U, \mathcal{S} of SET COVER where U is the collection of n elements and \mathcal{S} is the collection of subsets of U . 4
 1. (1 pts) Write LP-Relaxation of the ILP that captures the problem and its dual.
 2. (1 pts) Write a f -factor approximation algorithm that solves the problem using the techniques of deterministic rounding, where f is the maximum frequency of any element.
 3. (2 pts) Prove the correctness of your algorithm.
- (b) Suppose algorithm \mathcal{A} is polynomial time c -factor approximation algorithm for MINIMUM MULTICUT on trees. 5
 1. (2pts) Design a polynomial-time c -factor approximation algorithm for VERTEX COVER on general graphs.
 2. (3pts) Prove the correctness of your algorithm.