

UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN  
Facultad de Ingeniería Mecánica y Eléctrica

Homework 1

Due date: Mon 05-Feb-2024 18:00

Course: **Selected Topics on Optimization**

Semester: Spring 2024

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**Answer each question.**

1. Formally define an optimization problem.

We have a particular quantity that we are interested in maximizing or minimizing. However, we also have some auxiliary condition that needs to be satisfied

2. Formally define a linear optimization problem (also called linear programming problem).

Linear programming is a mathematical modeling technique that involves maximizing or minimizing a linear function while taking into account various constraints.

3. Formally define an integer optimization problem (also called integer programming problem).

is a linear programming (LP) problem in which the decision variables are further constrained to take integer values. Both the objective function and the constraints must be linear.

4. What is the method typically used for solving linear programming problems (of any size)?

The simplex method is a typical methodology for tackling optimization problems in linear programming

5. What is the method typically used for solving integer programming problems?

The most used method for solving an IP is the method of branch-and-bound.

6. What is the main difference between a linear programming problem and an integer programming problem?

Linear programming deals with finding the best outcome in a mathematical model whose requirements are represented by linear relationships, and Integer programming is a type of mathematical optimization where some or all of the variables are restricted to be integers.

7. When do we say that an optimization problem is “easy” to solve?

When it doesn't have a min or max. The problem can be solved with efficient algorithms

8. When do we say that an optimization problem is “hard” to solve?

When have complicated functions or constraints, infinite or disconnected feasible regions, many variables or objectives, or no fast algorithms to solve it.

9. What is a heuristic method for optimization problems?

It's a technique designed for problem solving more quickly when classic methods are too slow for finding an exact or approximate solution

10. What is an exact method for optimization problems?

It's the optimization method that can guarantee to find all optimal solutions

11. What is a brute-force method for optimization problems?

It's a generic approach to problem-solving that's employed when the issue is small enough to make an in-depth investigation possible.

12. What are the main reasons heuristic methods are used?

They allow you to use a "quick fix" to solve a minor problem or to narrow down options. They're also a great starting point for brainstorming or exploring new ideas.

13. What is a combinatorial optimization problem?

is a subfield of mathematical optimization that consists of finding an optimal object from a finite set of objects