Lassonde School of Engineering

Dept. of EECS

Professor G. Tourlakis

EECS 1028 Z. Problem Set No2

Posted: Feb. 7, 2025

Due: Feb. 26, 2025; by 6:00pm, in eClass.

Q: **How do I submit?**

A:

(1) **Submission must be a SINGLE *standalone* file to eClass. Submission by email is not accepted.**

(2) **Accepted File Types: PNG, JPEG, PDF, RTF, MS WORD, OPEN OFFICE, ZIP**

(3) **Deadline is strict, electronically limited.**

(4) **MAXIMUM file size = 10MB**

It is worth remembering (from the course outline):

The homework **must** be each individual's own work. While consultations with the instructor, tutor, and among students, are part of the learning process and are encouraged, **nevertheless**, *at the end of all this consultation* each student will have to produce an individual report rather than a *copy* (full or partial) of somebody else's report.

The concept of "late assignments" does not exist in this course, as you recall.

1. (3 MARKS) Find the *equivalence class*, **IDENTIFIED BY THE SMALLEST NON-NEGATIVE integer** possible, for $\equiv_3$ where the integer -1010546 belongs to.

2. (2 MARKS) TRUE or FALSE and *WHY*? (No correct "WHY" yields 0 MARKS)

"If the range of a relation $\mathbb{R}$ is a set, then $\mathbb{R}$ is a set."

3. (3 MARKS) Show that the relation $\subseteq$ —where NO left/right fields are chosen *a priori*— is a *proper class*.

4. (2 MARKS) Show for a relation $\mathbb{S}$ that if both the range and the domain are sets, then $\mathbb{S}$ is a set.

5. (3 MARKS) Prove that $\mathbb{N}^2$ is an equivalence relation on $\mathbb{N}$.

6. (4 MARKS) Let R be symmetric. Show that so is R^+.

Hint. Is the same true if we replace "R^+" in the statement with "R^n", for $n \geq 2$?

7. (3 MARKS) Show that a relation $\mathbb{R}$ is symmetric iff, for all x, y,

$$xRy \equiv y\mathbb{R}x$$

Caution 1. Be sure (by consulting the NOTEs, not any other "authority"; that we start this problem on the same page as to what "symmetric relation" is defined as.

Caution 2. There are two directions in "iff".

8. (3 MARKS) Show that a relation S is transitive iff $S = S^+$.

Hint. There are two directions in "iff".

9. (4 MARKS) Let R on A be reflexive. Prove that R^+ is also reflexive.