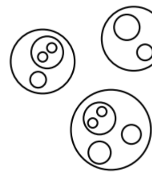
Quiz #2 Maximum Marks: 20, Maximum Time: 20 mins
Date : 30/09/2024
MTH210: Discrete Structures **Name:** ______________________
Semester: Monsoon 2024 **Tutorial Section:** ______________________

Problem 1. [8] Consider the drawing below.



Let X be the set of circles in the drawing and define a binary relation $\sim$ on X by

$$x \sim y \Leftrightarrow x \text{ and } y \text{ contain the same number of circles.}$$

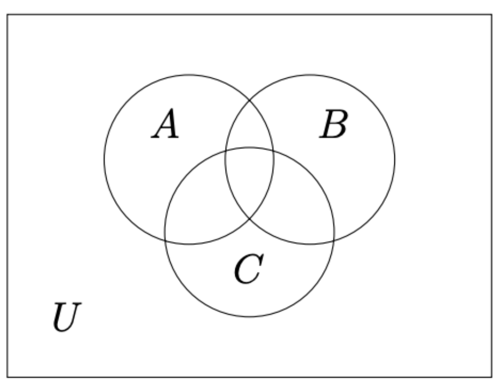
The relation $\sim$ is actually an equivalence relation on X (you do not need to prove this).

(a) How many elements are there in the set X? Just write the number, no explanation needed.

(b) How many equivalence classes does the equivalence relation have? Write the number and then provide an explanation.

(c) How many elements does each equivalence class have? Just write the numbers, no explanation needed.

Problem 2. [3] Clearly shade the set $(A \cup B) \cap (A \cap C)^c \cap (B \cup C)^c$ in the following Venn diagram. Do your rough work outside this diagram and only shade your final answer in the below diagram.



Problem 3. [9] Determine whether or not each of the following relations is a partial order on $\mathbb{N} \times \mathbb{N}$. If it is not a partial order then give a counterexample. If it is a partial order then

- provide a proof,
- check if it is also a total order,
- find all maximal and minimal elements if it has any,
- find the greatest and least elements if it has.

(a) $(a, b) \leq (c, d)$ if and only if $a \leq c$.

(b) $(a, b) \leq (c, d)$ if and only if $a \leq c$ and $b \geq d$.