ICS 6B F23 Take Home Exam 4 Redo

Due: November 2nd, 2023 at 11:59PM

Name: _____

UCI NetID : | | | | | | | | |

(**alpha-numeric; NOT your student ID**)

- **Read** the instructions of each question carefully.
- **All problems will have a "What to show" section that will describe exactly what work is expected of you we solving the problem. Failure to meet the requirements of the "What to show" sections will result in a Not Yet. If you have questions about what to show please ask on Ed.**
- An answer where thought process is unclear will be given a grade of Not Yet. Redo Specific: You must explain your mistake on your original exam in the RED box, or else your redo will not be graded.
- Your submission should follow the template exactly. Any insertion, removal, or reordering of pages from the original template may result in readers not grading certain problems. In such an event you will receive "Not Yet" and no feedback on the problems in question.
- Place your answers in the boxed regions. Writing outside of the boxes will not be considered as part of your answers.
- This exam will cover the Outcomes from the S Learning Objective
- Please keep in mind of the academic honesty guidelines. This take-home exam is to be **completed individually, with no outside help**. You may use any resources from our class (ZyBooks and resources from Canvas), but you may not use any other online resources.
- You may choose to print the exam or use a digital editor for completing the exam. It is required that you use this PDF to complete your work. If you have no access to a printer or digital tools to fulfill the exam, feel free to reach out to the staffs regarding your concern.
- If you have any questions, please post a private Ed or attend available Office Hours. Note that we are not allowed to provide specific help to answering the exam questions.

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Problem 1.1 (S1)

a) Express the set of composite integers greater than 10 and less than 20 using roster notation.
b) Express this set $\{19, 28, 37, 46, 55, 64, 73, 82, 91\}$ using set builder notation.
What you need to show: For each of the two parts, writing down the answer is sufficient. No need to explain. For part a), please write your answer in the little boxes of the answer sheet (one element using one box, you may not use all the boxes)

Problem 1.2 (S1)

Let $P = \{1, 2, 3, \{1, 2\}, \{2, 3\}, \{1, 2, 3\}\}$ and $Q = \{3, 2, 1, \{1, 2, 2\}, \{3, 2\}, \{3, 2, 1\}\}$.
Determine the truth value of the following statements:
a) $P = Q$
b) $\{1, 3\} \in P$
c) $\{2, 1\} \subset Q$
What you need to show: For each of the three parts, state the truth value and briefly (a sentence or two) explain why.

Problem 2.1 (S2)

Sets A, B, C and D are defined below and assume the universal set is the set of integers, Z:
$A = \{x \in Z : \text{x is a multiple of 4}\}$
$B = \{-4, 0, 2, 4, 5, 6, 8\}$
$C = \{x \in Z^+ : \text{x is a composite number less than 10}\}$
$D = \{c, d\}$
For each of the following sets, express it in roster notation and write down the cardinality of it:
a) $C \cup (A \cap B)$
b) $(B \cup C) \cap \overline{A}$
c) $D \times (B \cap C)$
What you need to show: For each of the three parts, writing down the answer is sufficient. No need to explain. Please write your answer in the little boxes of the answer sheet (one element using one box, you may not use all the boxes)

Problem 2.2 (S2)

The set subtraction law states that $A - B = A \cap \overline{B}$. Use the set subtraction law as well as the other set identities given in the table to prove $A \oplus (A \cup B) = B - A$. Note that $A \oplus B = (A - B) \cup (B - A)$.
What you need to show: Label each step in your proof with the set identity used to establish that step.

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Problem 3 (S3)

There is a conference with 200 people registered, and organizers need to allocate rooms for different workshops and sessions. Determine whether the given subsets form partitions for the 200 people or not. Note that for a sequence of sets $A_1, A_2, \ldots, A_n$ to be a partition of A, they need to satisfy the following 4 properties:

- Property 1: $\forall i, A_i \subseteq A$
- Property 2: $\forall i, A_i \neq \emptyset$
- Property 3: $A_1, A_2, \ldots, A_n$ are pairwise disjoint
- Property 4: $A = A_1 \cup A_2 \cup \cdots \cup A_n$

a) There are different rooms assigned to different workshops or sessions. For each room, attendees (only considering the 200 people registered) who went there during the conference form a subset (no matter they left later or stayed they would be counted as an element of the subset). Assume all 200 people attended and there were no empty rooms. Some attendees moved between rooms during the conference to attend various sessions.
b) There are different dietary types for meals during the conference (e.g., vegetarian, vegan, gluten-free). For each dietary type, attendees (only considering the 200 people registered) who chose it form a subset. Assume every attendee only chose one dietary type and every dietary type was chosen by some people. However, unfortunately, 10 people among the 200 people registered didn't attend the conference for some reason.
What you need to show: For each part, explicitly state which property of a partition has been violated and briefly (one or two sentences) explain why.