## MAT2440, Classwork20, Spring2025

ID:	Name:
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1. Use the membership table to prove one of the De Morgan's law:  $\overline{A \cap B} = \overline{A} \cup \overline{B}$ .

	Α	В	$A \cap B$	$A \cup B$	$\overline{A}$	$\overline{B}$	$\overline{A} \cup \overline{B}$	$\overline{A \cap B}$
	l				0	0	0	0
	- 1	0	0		0		)	
	0	1		1		0		1
<u></u>	0	0	0	0				Í
_					•	•	•	

2. The Computer Representation of Sets:

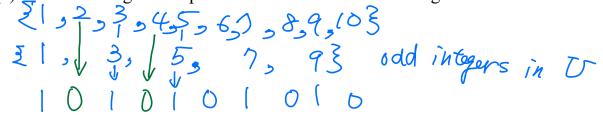
acA acB

acA a&B

ath acb

Let S be a set and U be the universal set. If the universal set U is finite order, then S can be represented bit strings.

- 3. Let the universal set  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ , and the ordering of element of U has the elements in increasing order.
  - (a) What bit strings can represent the subset of all odd integers in U?



(b) What bit strings can represent the set  $B = \{1, 2, 5, 6\}$  in U?

$$U=\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$
 $B=\{1, 2, 5, 6, 7, 8, 9, 10\}$ 
 $A=\{1, 2, 5, 6, 7, 8, 9, 10\}$ 
 $A=\{1, 2, 5, 6, 7, 8, 9, 10\}$ 
 $A=\{1, 2, 5, 6, 7, 8, 9, 10\}$ 

(c) What set in U can be represented by the bit string 00 1111 0010?

$$\begin{array}{c} 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \\ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0 \ 1 \ 0 \\ \Rightarrow \ \underbrace{3, 4, 5, 6, 9}_{3} \end{array}$$

(d) Let $A_1 = \{1, 2, 3, 4, 5\}$ and $A_2 = \{1, 3, 5, 7, 9\}$ in $U$ . Use bit string to find $A_2$	$A_1 \cup A_2$	and
$A_1 \cap A_2$ .		

4. The Generalized Unions and Intersections with the **finite** family of sets:

The union of the sets  $A_1, A_2, \dots, A_n$ : \_\_\_\_\_ = \_\_\_\_.

The intersection of the sets  $A_1, A_2, \dots, A_n$ : \_\_\_\_\_ = \_\_\_\_.

5. The Generalized Unions and Intersections with the **infinite** family of sets:

The union of the sets  $A_1, A_2, \dots, A_n, \dots : \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$ .

The intersection of the sets  $A_1, A_2, \dots, A_n, \dots = \underline{\phantom{A}}$ 

6. Let  $A = \{0, 2, 4, 6, 8\}$ ,  $B = \{0, 1, 2, 3, 4\}$ , and  $C = \{0, 3, 6, 9\}$ . Then find (a)  $A \cup B \cup C$  and (b)  $A \cap B \cap C$ .

7. Suppose that  $A_i = \{1, 2, 3, \dots, i\}$  for  $i = 1, 2, 3, \dots$ . Then find (a)  $\bigcup_{i=1}^{\infty} A_i$  and (b)  $\bigcap_{i=1}^{\infty} A_i$