Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
College of Computer Studies
Isulan Campus, Isulan, Sultan Kudarat

IT 111 – Discrete Mathematics
MIDTERM EXAMINATION
1st Semester SY 2024-2025

Name: _____ **Contact No:** _____

General Instructions:
1. Write all your answers in the provided space.
2. Write neatly and legibly using a black or a blue pen.
3. You may use the blank spaces in your questionnaire for your computation.

Test I: Modified True or False (30 pts)
Instruction: Write **TRUE** if the statement is correct or write **FALSE** if the statement is incorrect in the space provided before the number. If the statement is FALSE, change the underlined word or phrase to make the statement correct. Write the **CORRECT AND COMPLETE** statement in the space provided below each item.

_____ 1. A compound proposition is composed of at least two atomic statements and at least one connective.

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_____ 2. The English statement "The ball is white and round, therefore, it rolls." can be written as (P∨Q)→R.

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_____ 3. The De Morgan's Law for Logic states that "the negation of a conjunction is equivalent to the disjunction of the negation of the individual propositions", that is $\neg(p \wedge q) = \neg p \vee \neg q$.

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_____ 4. In the truth table method, when two propositions have exactly the same or identical columns for all possible combinations of truth-values of the individual propositions, they are said to be not logically equivalent.

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_____ 5. The general propositions $p \leftrightarrow q$ and $\neg(p \oplus q)$ are not logically equivalent.

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_____ 6. The ordered pairs (x, y) and (x, z), are equal, that is, $(x, y)=(x, z)$, if and only if $x = z$.

_____

_____ 7. If $S = \{1,2,3,4,5,6,7,8,9\}$ and $T = \{5,6,7,8,9\}$, then $S \subset T$.

_____

_____ 8. If $S = \{1,2,3,4,5,6,7,8,9\}$ and $T = \{5,6,7,8,9\}$, then $-T = \{1,2,3,4\}$.

_____

_____ 9. All functions are relations.

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_____ 10. The equation $y = x + 1$ is a relation but not a function.

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Test II: Multiple Choice (30 pts)
Instruction: Write the letter corresponding to your best choice of answer. Write clearly in **CAPITAL LETTERS**.

_____ 11. Let S and T be sets. Which of the following elements of sets S and T is appropriate so that S is a strict/proper subset of T ($S \subset T$)?

A. S={real numbers} and T={integers}
B. $S = \{1,2,3\}$ and $T = \{1,3,5,7\}$
C. $S = \{a, b, c, d, \ldots, x, y, x\}$and $T = \{a, b, c\}$
D. None of the above.

_____ 12. Let $A = \{\ldots, -30, -20, -10,0,10,20,30, \ldots\}, B = \{10,20,30, \ldots\}$, and $C = \{positive\ integers\}$ be sets. Which of the following statements is true?

A. $A \subset B$
B. $B \subseteq C$
C. $A \subseteq C$
D. $B \subset A$

_____ 13. Which of the following pairs of sets are equal?

A. $\{1,2,3\}$ and $\{1,2,3\}$
B. N =set of natural/counting numbers and $\{0,1,2,3, \dots\}$
C. Z =set of integers and $\{1,2,3, \dots\}$
D. All of the above.

_____ 14. Which of the following follows the De Morgan's Law of Sets?

A. The complement of the union is equal to the union of the complements.
B. The complement of the union is equal to the intersection of the complements.
C. The complement of the intersection is equal to the intersection of the complements.
D. None of the above.

_____ 15. Let $A = \{c, o, m, p, u, t, e, r\}$ and $B = \{s, c, i, e, n, c, e\}$. What is the cardinality of $A \cap B$?

A. $|\{c, e\}| = 2$
B. $|\{c, e, c, e\}| = 4$
C. $|\{c, o, m, p, u, t, e, r, s, c, i, e, n, c, e\}| = 15$
D. None of the above.

_____ 16. Which of the following is true about an ordered pair?

A. An ordered pair is a collection of unordered objects denoted by (a, b).
B. Two ordered pairs (a, b) and (c, d) are equal if and only if $a = c$ and $b = d$.
C. $(x, y) = (y, x)$ for any $x, y \in \mathbb{R} = \{real\ numbers\}$
D. None of the above.

_____ 17. Which of the following is true about the Cartesian products of sets?

A. The Cartesian product of two sets is a set of ordered pairs.
B. The Cartesian products of two sets A and B is written as $A + B$.
C. Let A and B be sets, the Cartesian products $A \times B$ and $B \times A$ are always equal.
D. None of the above.

_____ 18. Let $A = \{2,4,6\}$ and B={1,3,5}. What are the elements of $\mathbb{R}$ such that $x \in A$ is greater than $y \in B$?

A. $\mathbb{R} = \{(2,3), (2,5), (4,5)\}$
B. $\mathbb{R} = \{(2,1), (4,1), (4,3), (6,1), (6,3), (6,5)\}$
C. $\mathbb{R} = \{(2,1), (2,3), (2,5), (4,1), (4,3), (4,5), (6,1), (6,3), (6,5)\}$
D. $\mathbb{R} = \{(1,2), (1,4), (1,6), (3,2), (3,4), (3,6), (5,2), (5,4), (5,6)\}$

_____ 19. Which of the following statements about functions is true?

A. The elements of the domain can have one or more pairs with elements of the co-domain.
B. Every element of the domain must have a unique pair with any element of the co-domain.
C. There exists an element in the domain which does not have a pair with any element in the co-domain.
D. The domain and co-domain must always have the same cardinality.

_____ 20. Which of the following is/are true about compound propositions?

I. Compound propositions must end with a question mark.
II. Compound propositions are consisted of one or more atomic statements and one or more connectives.
III. Compound propositions can be evaluated as either true or false.
IV. Compound propositions are joined by connectives such as conjunction, disjunction, negation, and conditional.

A. I only.
B. II and III only
C. II, III, and IV only
D. All of the above

_____ 21. Which of the following symbolic logic represents the statement “I think, therefore, I am.”?

A. $p \wedge q$
B. $p \vee q$
C. $p \rightarrow q$
D. $p \leftrightarrow q$

Table 1. Truth Table.

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
$\boldsymbol{p}$	$\boldsymbol{q}$	$\boldsymbol{\neg p}$	$\boldsymbol{p \wedge q}$	$\boldsymbol{p \vee q}$	$\boldsymbol{p \rightarrow q}$	$\boldsymbol{T}$	$\boldsymbol{F}$
T	T	F		F	T	F	T
T	F	F		F	F	F	T
F	T	T		F	T	F	T
F	F	T		T	F	F	T

Note: $\boldsymbol{T}$ = **Tautology**, a proposition that is always true, **and** $\boldsymbol{F}$ = **Fallacy**, a proposition that is always false.

_____ 22. In Table 1, which of the following is the correct entry in Column 4?

A.	**B.**	**C.**	**D.**
$\boldsymbol{p \wedge q}$	$\boldsymbol{p \wedge q}$	$\boldsymbol{p \wedge q}$	$\boldsymbol{p \wedge q}$
T	F	T	T
F	F	T	F
F	F	T	T
F	T	F	F

_____ 23. In Table 1, which column(s) contain incorrect entries

A. Column 3
B. Columns 5 and 7
C. Columns 5, 6, and 7
D. Columns 5, 7, and 8

_____ 24. Which of the following statements is true about logical equivalence?

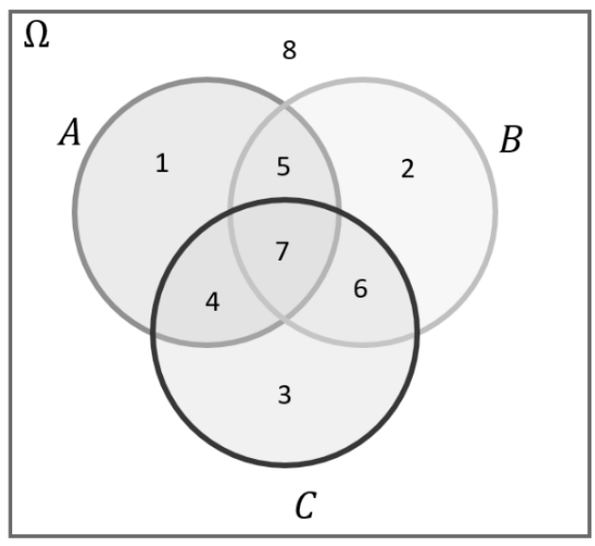
A. Propositions P and Q are logically equivalent if and only if the truth conditions of P are exactly the same as the truth conditions of Q.
B. Propositions P and Q are logically equivalent if the truth conditions of P are exactly the same as the truth conditions of Q.
C. Propositions P and Q are logically equivalent if and only if the truth conditions of P are exactly the opposite as the truth conditions of Q.
D. None of the above.

_____ 25. Which of the following propositions is logically equivalent to $p \wedge (q \vee r)$?

A. T
B. $(p \vee q) \wedge (p \vee r)$
C. $p \wedge q) \vee (p \wedge q)$
D. None of the above

Test III: Problem Solving: (30 pts)

26. Let A, B, and C be three sets. Illustrate the following using a Venn Diagram by selecting the number corresponding to the area that is included in the following sets: (2 pts each)



Example: $A \cap B$: $\{5,7\}$

a. $B - C$:

b. $B - (A \cap C)$:

c. $B - (A \cup C)$:

d. $A \cap B \cap C$:

e. $\Omega - (B \cap C)$:

27. What is a set? Explain in your own words and give examples to illustrate. (5 pts)

28. What is a function? Explain in your own words and give examples to illustrate. (5 pts)

29. What is a propositional logic? Explain in your own words and give examples to illustrate. (5 pts)

30. Using the truth table, show that the propositions $P =$ and Q are equivalent. (15 pts).

********END OF EXAM*******

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