King Saud University

Department of Mathematics

2nd Semester 1436-1437 H

MATH 151 (Discrete Mathematics)

1st Midterm Exam

Duration: 90 Minutes

Name:

Sequence Number:

Teacher's Name:

Section:

Question	Mark
Question I	
Question II	
Question III	
Question IV	
Total	

Question Number	1	2	3	4	5	6	Total
Answer							

Question I:

A. Choose the correct answer, then fill in the table above:

(1) The statement "$(p \wedge q) \vee (\neg p \vee \neg q)$ " is a

(a) Tautology (b) Contradiction (c) Contingency (d) None of the previous

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(2) Let $P(x, y)$ be the statement" $y - x \; is \; odd$ " then

(a) $P(1,5)$ is true (b) $P(2,5)$ is true (c) $P(3,5)$ is true (d) None of the previous

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(3) The contrapositive of the statement "$if \; |x| = x \; then \; x \geq 0$"is

(a) $if \; |x| \neq x \; then \; x < 0$ (b) $if \;\; x \geq 0 \; then \; |x| = x$

(c) "$if \; x < 0 \; then \; |x| \neq x$ (d) None of the previous

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(4) $\neg(\exists x: (x^2 > 2 \vee y \neq 2))$ is equivalent to

(a) $\forall x: (x^2 \leq 2 \wedge y = 2)$ (b) $\exists x: (x^2 \leq 2 \wedge y = 2)$

(c) $\forall x: (x^2 \leq 2 \vee y = 2)$ (d) None of the previous

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(5) $\exists! \, x \; (|x| = 1)$ is

(a) True (b) False (c) None of the previous

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(6)) If $A \; and \; B$ are sets, then $A \cap (B - A) =$

(a) A (b) $B - A$ (c) $\emptyset$ (d) None of the previous

Question II:

A. **Without using truth tables** prove the following:

$$\neg p \vee (r \rightarrow \neg q) \equiv (p \rightarrow \neg r) \vee \neg q$$

B. Is the following argument valid or invalid? Justify your answer:

$$\begin{array}{l} p \rightarrow r \\ \neg r \wedge p \\ p \vee s \\ \hline \therefore s \end{array}$$

Question III:

A. Prove that the product of two rational numbers is rational.

B. Prove **by cases** that "$n^2 + 3n \; is \; even$", for every integer number n.

Question IV:

A. Prove that the statement "$n^2 - 4n \leq 0$ $for\ every\ integer\ number\ n$" is **false**.

B. If the universal set $U = \{1,2,3,4,5,6\}$ and $A = \{1,2,3\}$, $B = \{3,4\}$ and $C = \{4\}$, then answer the following:

(1) Find the sets $\overline{A \cap C}$ and $B - A$.

(2) Find $A \times B$.

(3) $|P(A \cup B)|$

(4) Is the set $D = \{3\}$ a subset of $A \cap B$?

Good Luck☺