	Alexandria Higher Institute of Engineering & Technology (AIET)		
	Computer Engineering (CE) Department		2 <sup>nd</sup> Year
	CE 171	Introduction to Discrete Mathematics	1 <sup>st</sup> Semester, 2018-2019
	Instructor	Dr. Fatma Ahmed	Sheet (2)

## Sheet (2)

### The logic of compound statements

#### Question 1:

Construct truth tables for the following statement forms:

- $\sim p \vee q \rightarrow \sim q$
- $p \vee (\sim p \wedge q) \rightarrow q$
- $p \wedge \sim r \leftrightarrow q \vee r$
- $(p \rightarrow r) \leftrightarrow (q \rightarrow r)$

#### Question 2:

Use truth tables to verify that:

- $p \rightarrow q \equiv \sim p \vee q$
- $\sim (p \rightarrow q) \equiv p \wedge \sim q$

#### Question 3:

Write negations for each of the following statements:

- If  $p$  is a square, then  $p$  is a rectangle.
- If  $n$  is prime, then  $n$  is odd or  $n$  is 2.
- If  $x$  is nonnegative, then  $x$  is positive or  $x$  is 0.
- If Tom is Ann's father, then Jim is her uncle and sue is her aunt.

#### Question 4:

Write contrapositives for the statements of Question 3.

#### Question 5:

Write the converse and inverse for each statements of Question 3.

#### Question 6:

Use truth tables to determine whether the following argument forms are valid:

- $$\begin{array}{l} p \rightarrow q \\ q \rightarrow p \\ \therefore p \vee q \end{array}$$
- $$\begin{array}{l} p \\ p \rightarrow q \\ \sim q \vee r \\ \therefore r \end{array}$$


- $$\begin{array}{l} P \vee q \\ p \rightarrow \sim q \\ P \rightarrow r \\ \therefore r \end{array}$$
- $$\begin{array}{l} p \rightarrow q \\ p \rightarrow r \\ \therefore p \rightarrow q \wedge r \end{array}$$

#### Question 7:

Prove modus tollens. In other word, prove that the following argument form is valid.

$$\begin{array}{l} p \rightarrow q \\ \sim q \\ \sim p \end{array}$$



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**Question 8:**

Use truth tables to show that the following forms of argument are invalid.

$$\begin{array}{l}
 P \rightarrow q \\
 1. \quad q \\
 \therefore p
 \end{array}$$

$$\begin{array}{l}
 P \rightarrow q \\
 2. \quad \sim p \\
 \therefore \sim q
 \end{array}$$