Lecture 02: Discrete Mathematics

Course Title: Discrete Mathematics **Course Code:** MTH211 **Class:** BSM-II

Objectives

The main aim of the lecture is to discuss about

- *proposition and its truth table*

References:

- S. Lipschutz and M. Lipson, Schaum's Outlines Discrete Mathematics, Third Edition, McGraw-Hil, 2007.
- K.H. Rosen, Discrete Mathematics and its Application, MeGraw-Hill, 6th edition. 2007.
- K.A. Ross, C.R.B. Wright, Discrete Mathematics, Prentice Hall. New Jersey, 2003.
- https://www.freepik.com/ (for background image)

Propositions & Truth Tables

Let *P(p, q, . . .)* denote an expression constructed from logical variables *p, q, . . .*, which take on the value TRUE (T) or FALSE (F), and the logical connectives ∧, ∨, and ¬ (and others discussed subsequently). Such an expression *P(p, q, . . .)* will be called a *proposition*.

For example: $\sim(p \wedge q) \vee r$ and $(\neg p \wedge q) \vee (r \vee \neg s)$.

The main property of a proposition *P(p, q, . . .)* is that its truth value depends exclusively upon the truth values of its variables, that is, the truth value of a proposition is known once the truth value of each of its variables is known. A simple concise way to show this relationship is through a *truth table*. We describe a way to obtain such a truth table below.

For example truth tables of $p \wedge q$, $p \vee q$ and $\neg p$ are as follows:

As another example, consider proposition $\neg(p \land \neg q)$. Its truth table is as follows:

p	q	$\neg(p \land \neg q)$
T	T	T
T	F	F
F	T	T
F	F	T

But how we come to the last column in above table for $\neg(p \land \neg q)$. One method is as follows:

Alternate Method for Constructing a Truth Table

Another way to construct the truth table of $\neg(p \wedge \neg q)$ *as* follows:

THANKS FOR YOUR ATTENTION