# CM 1606 Computational Mathematics

## Tutorial No 04

1) Build truth tables for given formulas and identify logically equivalent pairs.

$i) \sim (p \wedge q)$
$ii) \sim (p \vee q)$
$iii) \sim p \vee \sim q$
$iv) \sim p \wedge \sim q$
$v) p \wedge (q \vee r)$
$vi) p \vee (q \wedge r)$
$vii) (p \wedge q) \vee (p \wedge r)$
$viii) (p \vee q) \wedge (p \vee r)$
$ix) p \rightarrow q$
$x) \sim q \rightarrow \sim p$

2) Absorption Laws: Build the truth tables for the following formulas and show that both formulas are logically equivalent to the proposition 'p' itself.

$i) p \wedge (p \vee q)$
$ii) p \vee (p \wedge q)$

3) Show that $p \rightarrow q$ is logically equivalent to both formulas $\sim p \vee q$ and $\sim q \rightarrow \sim p$ using truth tables.

4) Build truth tables for the following formulas. Compare the results and identify logically equivalent pairs.

$i) \sim (p \rightarrow q)$
$ii) p \wedge (\sim q)$
$iii) p \leftrightarrow q$
$iv) (p \rightarrow q) \wedge (q \rightarrow p)$

5) Identify the tautologies and contradictions out of given formulas using truth tables.

$i) p \vee \sim p$

$ii) p \wedge \sim p$

$iii) (p \wedge q) \rightarrow p$

$iv) ((p \rightarrow q) \wedge p) \rightarrow p$

$v) (p \vee q) \wedge (\sim q \wedge \sim p)$

$vi) (p \rightarrow (q \vee r)) \vee (r \rightarrow \sim p)$

$vii) p \rightarrow (p \vee q)$

6) Three boxes are presented to you. Only one box contains the gold and the other two are empty. Each box has imprinted on it a clue as to its contents; the clues are:

Box 1 : “Gold is here”

Box 2 : “Gold is not here”

Box 3 : “Gold is not in box 1”

Only one message is true and the other two are false. Which box has the gold?