CS & IT ENGINEERING

DISCRETE MATHS

Mathematical Logic

Lecture No. 09

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TOPICS

01 Connectives

02 Type 1

03 Type 2

$$[p \to (q \to r)] \to [(p \to q) \to (p \to r)]$$

a) $\neg(p \vee \neg q) \to \neg p$

b) $p \to (q \to r)$

c) $(p \to q) \to r$

d) $(p \to q) \to (q \to p)$

e) $[p \wedge (p \to q)] \to q$

f) $(p \wedge q) \to p$

g) $q \leftrightarrow (\neg p \vee \neg q)$

h) $[(p \to q) \wedge (q \to r)] \to (p \to r)$

a) $[(p \to q) \wedge (q \to r)] \to (p \to r)$

b) $[(p \to q) \wedge \neg q] \to \neg p$

c) $[(p \vee q) \wedge \neg p] \to q$

d) $[(p \to r) \wedge (q \to r)] \to [(p \vee q) \to r]$

a) $[p \wedge (p \to q) \wedge r] \to [(p \vee q) \to r]$

b) $[[(p \wedge q) \to r] \wedge \neg q \wedge (p \to \neg r)] \to (\neg p \vee \neg q)$

c) $[[p \vee (q \vee r)] \wedge \neg q] \to (p \vee r)$

$$((\neg p \wedge q) \wedge (q \rightarrow (p \rightarrow R))) \rightarrow \neg R$$

F

T T T

F

$\neg p \wedge q$ $\quad$ $q \rightarrow (p \rightarrow R)$

$\downarrow$ $\quad$ $\neg q \vee (\neg p \vee R)$

q $\quad$ q

$\neg p \vee R$

$\neg p$

$\neg p \wedge (\neg p \vee R)$

$\neg p$

Type-2 :

$\leftrightarrow \mid \equiv$

$$q \leftrightarrow (\neg p \vee \neg q)$$

$$T \leftrightarrow (F \vee F)$$

$$T \leftrightarrow F \equiv F$$

$T \leftrightarrow T$ ✓

$F \leftrightarrow F$ ✓

7. For the universe of all integers, let $p(x)$, $q(x)$, $r(x)$, $s(x)$, and $t(x)$ be the following open statements.

no/none

$p(x)$: $x > 0$

$q(x)$: x is even $\forall x\,[(q(x) \wedge r(x)) \rightarrow s(x)]$ $\forall x\,[\quad \rightarrow \neg \quad]$

$r(x)$: x is a perfect square

$s(x)$: x is (exactly) divisible by 4

$t(x)$: x is (exactly) divisible by 5

a) Write the following statements in symbolic form.

i) At least one integer is even. $\neg x\, q(x)$

ii) There exists a positive integer that is even. $\exists x\,[p(x) \wedge q(x)]$

iii) If x is even, then x is not divisible by 5. $\forall x\,[q(x) \rightarrow \neg t(x)]$

iv) No even integer is divisible by 5.

v) There exists an even integer divisible by 5.

vi) If x is even and x is a perfect square, then x is divisible by 4.

English $\longrightarrow$ conversion.

Graph is connected. $\rightarrow \forall x\,[G(x) \rightarrow C(x)]$

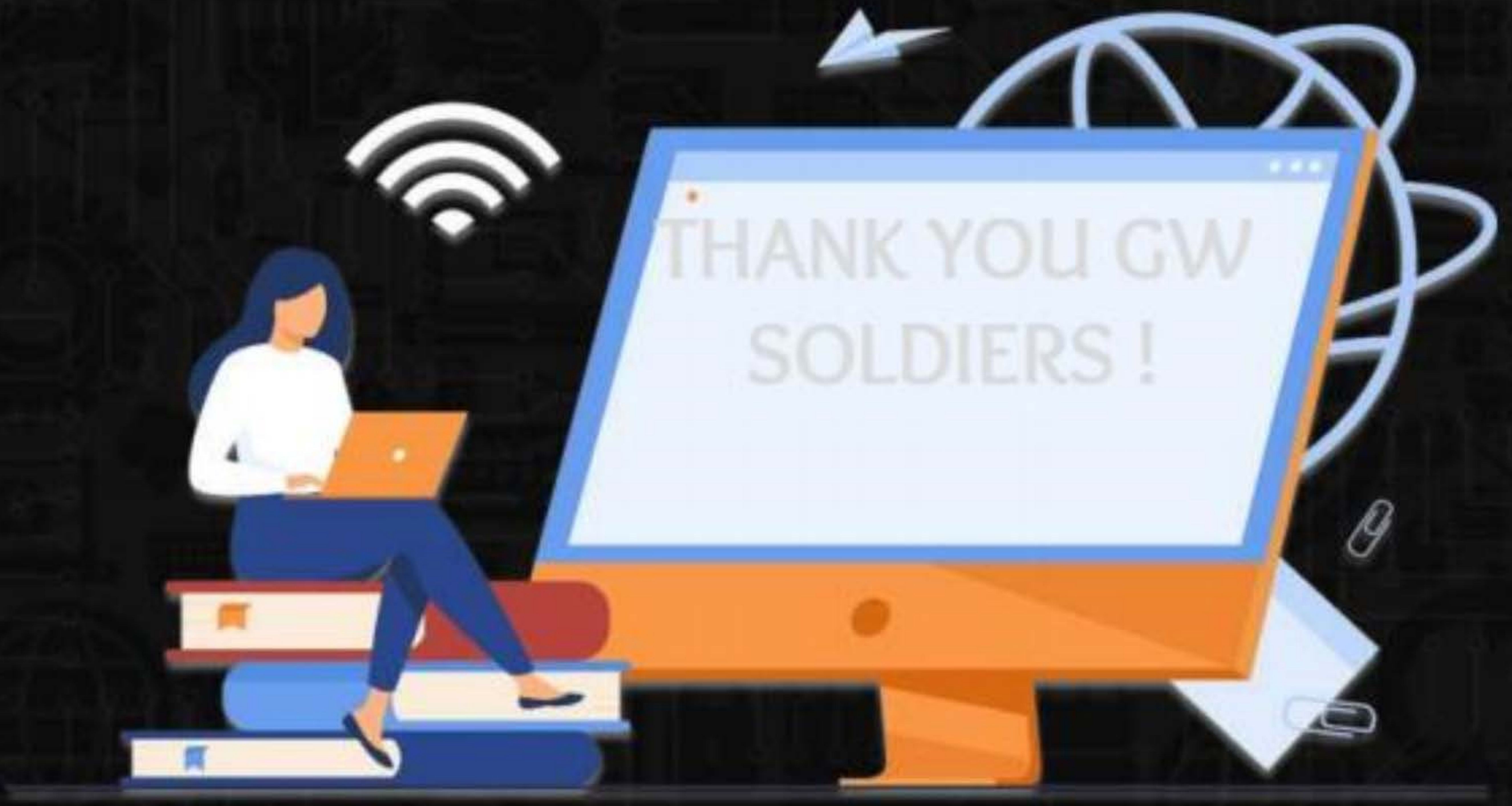
Gold and silver ornaments are precious.

$$\forall x\,(G(x) \land S(x) \rightarrow P(x))$$

$$\forall x\,(G(x) \lor S(x) \rightarrow P(x))$$

$\boxed{T \lor}$

$\boxed{\surd T}$


THANK YOU GW
SOLDIERS !