جامعة المنارة

كلية: الهندسة

اسم المقرر: الرياضيات المتقطعة

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تمارين داعمة

write a truth table for the following statement:

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

p	q	$p \oplus q$	$p \wedge q$	$(p \oplus q) \rightarrow (p \wedge q)$
T	T	F	T	T
T	F	T	F	F
F	T	T	F	F
F	F	F	F	T

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T	F	T	F	F
F	T	T	F	F
F	F	F	F	T

Verify this logical equivalence:

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

$(p \rightarrow r) \wedge (q \rightarrow r) \equiv (\neg p \vee r) \wedge (\neg q \vee r)$ conditional law

$\equiv (\neg p \wedge \neg q) \vee r$ distributive law

$\equiv \neg (p \vee q) \vee r$ De Morgan law

$\equiv (p \vee q) \rightarrow r$ conditional law

- Let $D=\{1,2,3,4,5,6\}$, $p(x,y)= (x \leq y)$

Write the truth value of the following statements:

1- $\exists y \in D \ \ p(6,y)$

True , $\exists y= 6 \in D$: $p(6,6)=(6 \leq 6)$

2- $\exists x \in D \ \ \forall y \in D \ p(x,y)$

True , $\exists x=1 \in D$, $\forall y \in D$: $p(1,y)$ is true

3- $\forall x \in D \ \forall y \in D \ \ p(x,y)$

False , $\exists x=5 \in D$, $\exists y= 1 \in D$: $p(5,1)=(5 \geq 1)$.

4- $\forall x \in D \ \exists y \in D \ p(x,y)$

True , $\forall x \in D$, $\exists y \geq x \ \in D$: $p(x,y)$ is true.

Let A = {1,2,3,4} , Define a binary relation *S* from A to A as follows:

$S = \{ (a,b) : a * b \leq 6 \}$

1- Write *S* as a set of ordered pairs.

2- determine its properties.

Solution:

S= {(1,1), (1,2), (1,3), (1,4), (2,1), (2,2), (2,3), (3,1),(3,2),(4,1)}

	reflexive	irreflexive	symmetric	antisymmetric	asymmetric	transitive
S			×			

Note:

S is not reflexive because ∃ 3 ∈A but (3,3)∉ S.

S is symmetric because ∀(a,b) ∈ S ⟶ (b,a) ∈ S.

S is not transitive because ∃(2,1) ∈ S ∧ ∃ (1,4) ∈ S but (2,4)∉ *S*.