**1. Conceptos Básicos (Formalización):**

**T:** Formalización 0:

**P:** “p does not imply q” is translated to propositional logic as:

**A:** !(p->q)

**T:** Formalización 1:

**P:** Translate into logic the sentence below (consider the letters p, q, r, … in order)

“To love or not to love when to be or not to be”:

**A:** (q or !q) -> (p or !p)

**T:** Formalización 2:

**P:** Translate the sentence “if p then q else r” into propositional logic:

**A:** (p -> q) ^ (!p -> r)

**T:** Formalización 3:

**P:** Translate into logic (using p, q, r, … in order)

“the cows are crazy only if they don’t do normal things or humans take care of them”

**A:** p -> (!q or r)

**T:** Formalización 4:

**P:** Check the correct translation (using p, q, r, … in order): “Only if I attend the lectures and I strudy, I will pass the exam”

**A:** r -> (p ^ q)

**2. Conceptos Básicos (Evaluación):**

**T:** Evaluación 1:

**P:** Let A be:

A = [(!p ^ q) or (!q -> p)] -> (!p -> !q)

And let I-1 and I-2 be the following interpretations:

I-1 = {p=T, q=F}, I-2 = {p=F, q=F}

**A:** and therefore the formula is satisfiable

**T:** Evaluación 2:

**P:** Let A be:

A = (!p -> !q) -> [(!q -> p) or (p ^q)]

And let I-1 and I-2 be the following interpretations:

I-1 = {p=T, q=F}, I-2 = {p=F, q=F}

**A:** and therefore the formula is satisfiable

**T:** Evaluación 3:

**P:** Let A be:

A = [(!p ^ q) or (!q -> p)] -> (!p or !q)

And let I-1 and I-2 be the following interpretations:

I-1 = {p=T, q=F}, I-2 = {p=F, q=T}

**A:** and therefore the formula is satisfiable

**T:** Evaluación 4:

**P:** Let A be:

A = [(!p ^ q)] ^ (!q -> p)] -> (!p or !q)

And let I-1 and I-2 be the following interpretations:

I-1 = {p=T, q=F}, I-2 = {p=F, q=T}

**A:** and therefore the formula is satisfiable (it is also valid)

**3. Conceptos Básicos (Prove by contradiction):**

**T:** PBC 1:

**P/A:** To check the validity of **G=((p∨(¬p→q))→(q∨r))→((p∧¬q)→r)** using proofs by contradiction, you should assume there exists an interpretation I such that **G**^I is **FALSE**. According to this: **((p∧¬q)→r)**^I is **FALSE** and **((p∨(¬p→q))→(q∨r))**^I is **TRUE**.

Then, it is necessary for **(p∧¬q)**^I to be **TRUE** and **r**^I to be **FALSE**.

As a consequence **(q∨r)**^I is **FALSE**. Therefore: **(p∨(¬p→q))**^I must be **FALSE**.

As **p**^I is **TRUE**, it is **IMPOSSIBLE** that **(p∨(¬p→q))**^I is **FALSE**.

Therefore, **THERE IS A CONTRADICTION**.

**T:** PBC 2:

**P/A:** To check the validity of **G=((p∨¬q)→r)→((p∧(¬p→q))→(q∨r))** using proofs by contradiction, you should assume it exists an interpretation I such that **G**^I is **FALSE**. According to this, **((p∧(¬p→q))→(q∨r))**^I is **FALSE** and **((p∨¬q)→r)**^I is **TRUE**. Then it is necessary for **(p∧(¬p→q))**^I to be **TRUE** and for **(q∨r)**^I to be **FALSE**. As a consequence, **r**^I is **FALSE**. Therefore **(p∨¬q)**^I must be **FALSE**. As **q**^I is **FALSE** it is **IMPOSSIBLE** that **(p∨¬q)**^I is **FALSE**. Therefore, **THERE IS A CONTRADICTION**.

**T:** PBC 3:

**P/A:** To check the validity of **G=(p∨q↔r)∧(¬p∨r→s)→(q→s)** using proofs by contradiction, you should assume it exists an interpretation I such that **G**^I is **FALSE**. According to this, **((p∨q↔r)∧(¬p∨r→s))**^I is **TRUE** and **(q→s)**^I is **FALSE**. As a consequence **s**^I is **FALSE** and **q**^I is **TRUE**. In addition, both **(p∨q↔r)**^I and **(¬p∨r→s)**^I must be **TRUE**. As **s**^I is **FALSE**, **(¬p∨r)**^I must be **FALSE** and thus **p**^I is **TRUE** and **r**^I is **FALSE**. On the other hand, taking into account these truth values**(p∨q↔r)**^I is **FALSE**. Therefore **THERE IS A CONTRADICTION**.

**T:** PBC 4:

**P/A:** To check the validity of **G=((p∧q→r∧s)∧¬(q∨s))→(¬p∨¬q)** using proofs by contradiction, you should assume it exists an interpretation I such that **G**^I is **FALSE**. According to this, **((p∧q→r∧s)∧¬(q∨s))**^I is **TRUE** and **(¬p∨¬q)**^I is **FALSE**. As consequence **p**^I and **q**^I are **TRUE**. In addition, **(p∧q→r∧s)**^I must be **TRUE**. On the other hand, **(¬(q∨s))**^I must be **TRUE**, and thus **q**^I must be **FALSE** and **s**^I must be **FALSE**. Therefore **THERE IS A CONTRADICTION.**