Knowledge Check: Semantics of Propositional Logic

TOTAL POINTS 6

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1. **Consider the interpretation v where v(p) = F, v(q) = T, and v(r) = T. Assuming that the binding priority is ¬, ∧, ∨, →, which propositional formula does v *fail* to satisfy?**   **1 / 1 point**

   ○ ¬(¬p → q ∧ ¬r)

   ○ ¬(¬p → ¬q) ∧ r

   ⦿ (¬p ∨ ¬q) → (p ∨ ¬r)

   ○ (p → ¬q) ∨ ¬(r ∧ q)

   > ✓ **Correct**
   >
   > Correct! Following the rule of satisfiability and applying the values of p,q, and r, this option is not satisfied. Thus, it is not satisfied by v.

2. **Which propositional formula is logically equivalent to (p→q)∧(q→p)?**   **1 / 1 point**

   ○ (p∨q)∧(¬(p∧q))

   ○ (¬p∧q)∧(¬(p∧q))

   ⦿ ¬(((¬p)∧q)∨(p∧(¬q)))

   ○ (¬p∨q)∧(¬(p∧q))

   > ✓ **Correct**
   >
   > Correct! Applying True to both p and q in this formula makes it True, and applying False to both p and q also makes it True. Therefore, it is equivalent to (p→q)∧(q→p).

3. **Which formula is satisfiable?**   **1 / 1 point**

   ○ ¬(p∨¬p)

◯ (¬p∧p)

◯ None of these formulas is satisfiable.

◉ p → (q→p)

✓ **Correct**

Correct! A formula is satisfiable if some interpretation satisfies it. When both p and q are set to True, the formula is evaluated as True. Thus, it is satisfiable.

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4. **Which formula is a tautology?**   **1 / 1 point**

◯ p→(p→q)

◯ (p→q)→(p∨q)

◉ (p→q)→(¬p∨q)

◯ None of these formulas is a tautology

✓ **Correct**

Correct! A formula is a tautology if every interpretation satisfies it. No matter how we set p and q, the formula will always be evaluated to True. Therefore, it is a tautology.

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5. **Which set of formulas is satisfiable?**   **1 / 1 point**

◯ None of these sets is satisfiable.

◯ {p=null, p→q=null, ¬q∨¬p=null}

◉ {p∨q=null, ¬p∨¬q=null}

◯ {p∨q=null, ¬p∧¬q=null}

✓ **Correct**

Correct! A set of formulas is satisfiable if some interpretation satisfies all formulas. In this case, setting either one to True and the other to False satisfies both.

6. **Which set of formulas entails p?**

- ⦿ {q=null, q → p=null}

- ○ {p ∨ ¬p=null}

- ○ {q=null, p → q=null}

- ○ None of these formulas entails p.

✓ **Correct**

Correct! A set of formulas A entails a formula B if all interpretations that make the formulas in A true also make B True.