1)Sabendo que os valores lógicos das proposições p e q são, respectivamente, V e F, determine o valor lógico de cada uma das seguintes proposições:

A. () p ∧∼ q = v ^ v = v D. () ∼ p ∧ ∼ q = F ^ V = F

B. () p ∨∼ q = V v V = V E. () ∼ p ∨ ∼ q = F v V = V

C. () ∼ p ∧ q = F ^ V = F F. () p ∧ (∼ p ∨ q) = V ^ (F v F) = F

2) Seja v(p) o valor lógico da proposição p. Determine v(p) em cada um dos seguintes casos,

sabendo que:

A)

|  |  |  |
| --- | --- | --- |
| P | Q | p ∧ q |
| F | V | F |

B)

|  |  |  |
| --- | --- | --- |
| P | Q | p V q |
| F | F | F |

C)

|  |  |  |
| --- | --- | --- |
| P | Q | (P → Q) |
| V | F | F |

D)

|  |  |  |
| --- | --- | --- |
| Q | P | (q → p) |
| F | V | V |

E)

|  |  |  |
| --- | --- | --- |
| P | Q | (P ↔ Q) |
| V | F | F |

F)

|  |  |  |
| --- | --- | --- |
| Q | P | Q → P |
| F | V | V |

3) Construa as tabelas verdade das seguintes fórmulas e identifique as que são taulologias ou

contradições:

|  |  |  |
| --- | --- | --- |
| P | Q | ~ (p → ~q) |
| v | V | F |
| V | F | F |
| F | V | F |
| F | F | F |

A) Contradição

B) Tautologia

|  |  |  |
| --- | --- | --- |
| P | Q | (P→(Q→(Q→P))) |
| V | V | V |
| V | F | V |
| F | V | V |
| F | F | V |

C) Contradição

|  |  |  |
| --- | --- | --- |
| P | Q | q ↔ ~q ∧ p |
| V | V | F |
| V | F | F |
| F | V | F |
| F | F | F |

D) Tautologia

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | R | (p ∧ q → r) | (¬P ↔ (Q ∨ ¬R)) | (p ∧ q → r) ∨ (∼ p ↔ q ∨∼ r) |
| V | V | V | V | F | V |
| V | V | F | F | F | V |
| V | F | V | V | V | V |
| V | F | F | V | F | V |
| F | V | V | V | V | V |
| F | V | F | V | V | V |
| F | F | V | V | F | V |
| F | F | F | v | V | V |

4) Prove, usando tabela verdade, as seguintes equivalências:

A) p ∨ (q ∧ r) ⟺ (p ∨ q) ∧ (p ∨ r)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | R | p ∨ (q ∧ r) | (p ∨ q) ∧ (p ∨ r) | p ∨ (q ∧ r) ⟺ (p ∨ q) ∧ (p ∨ r) |
| V | V | V | V | V | V |
| V | V | F | V | V | V |
| V | F | V | V | V | V |
| V | F | F | V | V | V |
| F | V | V | V | V | V |
| F | V | F | F | F | V |
| F | F | V | F | F | V |
| F | F | F | F | F | V |

A2) p ∧ (q ∨ r) ⟺ (p ∧ q) ∨ (p ∧ r)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | R | p ∧ (q ∨ r) | (p ∧ q) ∨ (p ∧ r) | p ∧ (q ∨ r) ⟺ (p ∧ q) ∨ (p ∧ r) |
| V | T | T | V | V | V |
| V | T | F | V | V | V |
| V | F | T | V | V | V |
| V | F | F | F | F | V |
| F | T | T | F | F | V |
| F | T | F | F | F | V |
| F | F | T | F | F | V |
| F | F | F | F | F | V |

B) ~(~p) ⟺ p

|  |  |
| --- | --- |
| P | ~(~p) ⟺ p |
| V | V |
| F | V |

C)Lei DeMorgan (Augustus DeMorgan, nascido na ìndia, de família/educação inglesa, 1806- 1871).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | ~(p ∧ q) | ~p ∨∼ q | ~(p ∧ q) ⟺ ~p ∨∼ q |
| V | V | F | F | V |
| V | F | V | V | V |
| F | V | V | V | V |
| F | F | V | V | V |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | ~(p ∨ q) | ~p ∧∼ q | ~(p ∨ q) ⟺ ~p ∧∼ q |
| T | T | F | F | V |
| T | F | F | F | V |
| F | T | F | F | V |
| F | F | V | V | V |

5) Prove, usando tabela verdade, que qualquer dos conectivos estudados pode se expresso

usando somente os conectivos ∼ e ∧.

a) p ∨ q ⟺ ∼ (∼ p ∧ ∼ q)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | p ∨ q | ∼ (∼ p ∧ ∼ q) | p ∨ q ⟺ ∼ (∼ p ∧ ∼ q) |
| V | V | V | V | V |
| V | F | V | V | V |
| F | V | V | V | V |
| F | F | F | F | V |

b) p → q ⟺ ∼ (p ∧ ∼ q)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | (P → Q) | ~(P ∧ ~Q) | b) p → q ⟺ ∼ (p ∧ ∼ q) |
| V | V | V | V | V |
| V | F | F | F | V |
| F | V | V | V | V |
| F | F | V | V | V |