**Question 5 [12 marks]:**

Let p, q and r be propositions. Prove or disprove that p∧(q ≡ r) ≡ ((p∧q) ≡ (p∧r)).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| p | q | r | q ≡ r | p∧ (q ≡ r) | p∧q | p∧r | (p∧q) ≡ (p∧r) | p∧ (q ≡ r) ≡ ((p∧q) ≡ (p∧r)) |
| T | T | T | T | T | T | T | T | T |
| T | T | F | F | F | T | F | F | T |
| T | F | T | F | F | F | T | F | T |
| T | F | F | T | T | F | F | T | T |
| F | T | T | T | F | F | F | T | F |
| F | T | F | F | F | F | F | T | F |
| F | F | T | F | F | F | F | T | F |
| F | F | F | T | F | F | F | T | F |

Since the last column is not all true, p∧ (q ≡ r) ≡ ((p∧q) ≡ (p∧r)) is not valid.