QUE- 1 : -

1. (P ↔ Q) Ꚛ ( ¬P ↔ ¬R)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| P | Q | R | ¬P | ¬R | P ↔ Q | ¬P ↔ ¬R | P ↔ Q Ꚛ ¬P ↔ ¬R |
| TRUE | TRUE | FALSE | FALSE | TRUE | TRUE | FALSE | TRUE |
| TRUE | FALSE | FALSE | FALSE | TRUE | FALSE | FALSE | FALSE |
| TRUE | TRUE | TRUE | FALSE | FALSE | TRUE | TRUE | FALSE |
| TRUE | FALSE | TRUE | FALSE | FALSE | FALSE | TRUE | TRUE |
| FALSE | TRUE | FALSE | TRUE | TRUE | FALSE | TRUE | TRUE |
| FALSE | FALSE | FALSE | TRUE | TRUE | TRUE | TRUE | FALSE |
| FALSE | TRUE | TRUE | TRUE | FALSE | FALSE | FALSE | FALSE |
| FALSE | FALSE | TRUE | TRUE | FALSE | TRUE | FALSE | TRUE |

1. ( P Ꚛ Q ) ( P Ꚛ ¬Q)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | ¬Q | ( P Ꚛ Q ) | ( P Ꚛ ¬Q) | ( P Ꚛ Q ) ( P Ꚛ ¬Q) |
| TRUE | TRUE | FALSE | FALSE | TRUE | TRUE |
| TRUE | FALSE | TRUE | TRUE | FALSE | FALSE |
| FALSE | TRUE | FALSE | TRUE | FALSE | FALSE |
| FALSE | FALSE | TRUE | FALSE | TRUE | TRUE |

1. (P↔Q) Ꚛ (¬P↔Q)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | ¬P | ( P ↔ Q ) | ( ¬P ↔Q) | ( P ↔ Q ) Ꚛ ( ¬P ↔Q) |
| TRUE | TRUE | FALSE | TRUE | FALSE | TRUE |
| TRUE | FALSE | FALSE | FALSE | TRUE | TRUE |
| FALSE | TRUE | TRUE | FALSE | TRUE | TRUE |
| FALSE | FALSE | TRUE | TRUE | FALSE | TRUE |

QUE 2:-

1. ¬P (P Q)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | ¬P | P Q | ¬P ( P Q) |
| TRUE | TRUE | FALSE | TRUE | TRUE |
| TRUE | FALSE | FALSE | FALSE | TRUE |
| FALSE | TRUE | TRUE | TRUE | TRUE |
| FALSE | FALSE | TRUE | TRUE | TRUE |

1. P Q (P Q)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | P Q | P Q | P Q ( P Q) |
| TRUE | TRUE | TRUE | TRUE | TRUE |
| TRUE | FALSE | FALSE | FALSE | TRUE |
| FALSE | TRUE | FALSE | TRUE | TRUE |
| FALSE | FALSE | FALSE | TRUE | TRUE |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | ¬(P Q) | ¬Q | ¬(P Q) ¬Q |
| TRUE | TRUE | FALSE | FALSE | TRUE |
| TRUE | FALSE | TRUE | TRUE | TRUE |
| FALSE | TRUE | FALSE | FALSE | TRUE |
| FALSE | FALSE | FALSE | TRUE | TRUE |

1. ¬(P Q) ¬Q

|  |  |  |  |
| --- | --- | --- | --- |
| P | Q | ¬P | ¬Q |
| TRUE | TRUE | FALSE | FALSE |
| TRUE | FALSE | FALSE | TRUE |
| FALSE | TRUE | TRUE | FALSE |
| FALSE | FALSE | TRUE | TRUE |

**ANSWER:-** From the tables we can see that it is Tautology.

QUE 3:-

(P Q ) (P ¬Q) (¬P Q) (¬P ¬Q)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P Q | (P ¬Q) | (¬P Q) | (¬P ¬Q) | ANSWER |
| TRUE | FALSE | TRUE | TRUE | FALSE |
| FALSE | TRUE | TRUE | TRUE | FALSE |
| TRUE | TRUE | TRUE | FALSE | FALSE |
| TRUE | TRUE | FALSE | TRUE | FALSE |

ANSWER:- The proposition is not satisfiable.

QUE 4:-

(P Q ) (R S) AND (P R) (Q S)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P | Q | R | S | (P Q ) | (R S) | (P R) | (Q S) | (P Q ) (R S) | (P R) (Q S) |
| TRUE | FALSE | FALSE | TRUE | FALSE | TRUE | FALSE | TRUE | TRUE | TRUE |
| TRUE | FALSE | TRUE | FALSE | FALSE | FALSE | TRUE | TRUE | TRUE | TRUE |
| TRUE | FALSE | TRUE | TRUE | FALSE | TRUE | TRUE | TRUE | TRUE | TRUE |
| TRUE | TRUE | FALSE | FALSE | TRUE | TRUE | FALSE | FALSE | TRUE | TRUE |
| TRUE | TRUE | FALSE | TRUE | TRUE | TRUE | FALSE | TRUE | TRUE | TRUE |
| TRUE | TRUE | TRUE | FALSE | TRUE | FALSE | TRUE | FALSE | FALSE | FALSE |
| TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |
| TRUE | FALSE | FALSE | FALSE | FALSE | TRUE | FALSE | TRUE | TRUE | TRUE |
| FALSE | FALSE | FALSE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |
| FALSE | FALSE | TRUE | FALSE | TRUE | FALSE | TRUE | TRUE | FALSE | TRUE |
| FALSE | FALSE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |
| FALSE | TRUE | FALSE | FALSE | TRUE | TRUE | TRUE | FALSE | TRUE | FALSE |
| FALSE | TRUE | FALSE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |
| FALSE | TRUE | TRUE | FALSE | TRUE | FALSE | TRUE | FALSE | FALSE | FALSE |
| FALSE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |
| FALSE | FALSE | FALSE | FALSE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |

**ANSWER**:- These two statements are not logically equivalent.

QUE 5:-

1. Q P
2. Q ¬P
3. Q P
4. ¬Q P

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