Assignment 1

Jagadeesh Kunuru

1 Problem Statement

1.1 Icse/Cs/2019Q5c

Using a truth table, state whether the following proposition is a Tautology, Contradiction or Contingency:

$$\neg(P \Rightarrow Q) \iff (\neg P \cup Q)$$

2 Solution

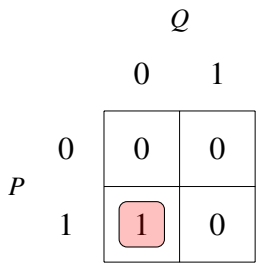
By drawing a truth table, we get to know whether the following proposition is Tautology, Contradiction or Contingency:

P	Q	$\neg P$	$P \Rightarrow Q$	$\neg(P \Rightarrow Q)$	$(\neg P \cup Q)$	$\neg(P \Rightarrow Q) \iff (\neg P \cup Q)$
T	T	F	T	F	T	F
T	F	F	F	T	F	F
F	T	T	T	F	T	F
F	F	T	T	F	T	F

Therefore, the given proposition is a Contradiction.

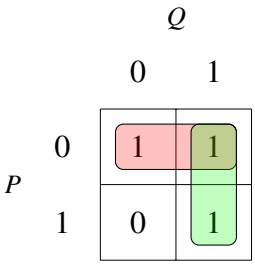
Writing the Proposition in Boolean expression:

K-Map for $\neg(P \Rightarrow Q)$



from K-Map $\neg(P \Rightarrow Q) = PQ^{'}$

K-Map for $(\neg P \cup Q)$



from K-Map $(\neg P \cup Q) = P^{'} + Q$

Now, the proposition $\neg(P \Rightarrow Q) \iff (\neg P \cup Q)$ can written be as $PQ^{'} \cap \mathrm{P}^{'} + Q$

Truth table for the Boolean expression:

$PQ^{'}$	$P^{'} + Q$	$PQ^{'} \cap \mathrm{P}^{'} + Q$
0	1	0
1	0	0
0	1	0
0	1	0

$PQ^{'}.\left(P^{'} + Q\right) = PP^{'}Q^{'} + P^{'}Q^{'}Q$ can be drawn as: