

Name: Nafinur Leo

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1.a) Truth table

$P$	$Q$	$\neg P$	$\neg Q$	$P \leftrightarrow Q$	$\neg P \oplus \neg Q$	$(P \leftrightarrow Q) \oplus (\neg P \oplus \neg Q)$
T	T	F	F	T	F	T
T	F	F	T	F	T	F
F	T	T	F	F	T	F
F	F	T	T	T	F	T
T	T	F	F	T	F	T
T	F	F	T	F	T	F
F	T	T	F	F	T	F
F	F	T	T	T	F	T

b) Truth table:

P	Q	r	$\neg P$	$P \rightarrow Q$	$\neg P \rightarrow r$	$(P \rightarrow Q) \vee (\neg P \rightarrow r)$
T	T	T	F	T	T	T
T	T	F	F	T	T	T
T	F	T	F	F	T	T
T	F	F	F	F	T	T
F	T	T	T	T	T	T
F	T	F	T	T	F	T
F	F	T	T	T	T	T
F	F	F	T	T	F	T

2. a)  $Q \rightarrow P$

b)  $\neg P \rightarrow \neg Q$

3. 11 01111001 and 1001001011

Bitwise OR ( $\vee$ ):

11 0111 1001

10 0100 1011

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11 0111 1011

Bitwise AND ( $\wedge$ ):

11 0111 1001

10 0100 1011

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10 0100 1001



Bitwise XOR ( $\oplus$ ):

11 0111 1001

10 0100 1011

01 0011 0010

~~4. a) If you get promoted, then you must have washed the boss's car.~~

4. b) If Faizal cheats, then he gets caught.

c) If you pay a subscription fee, then you can access the website.

5. Logically equivalent using a truth table:

P	Q	r	$Q \vee r$	$P \wedge (Q \vee r)$	$P \wedge Q$	$P \wedge r$	$(P \wedge Q) \vee (P \wedge r)$
T	T	T	T	T	T	T	T
T	T	F	T	T	T	F	T
T	F	T	T	T	F	T	T
T	F	F	F	F	F	F	F
F	T	T	T	F	F	F	F
F	T	F	T	F	F	F	F
F	F	T	T	F	F	F	F
F	F	F	F	F	F	F	F