CM12004: Problem Sheet

1. (i)

X	Y	P	Q	$P \rightarrow Q$
0	0	0	1	1
0	1	1	1	1
1	0	1	1	1
1	1	1	0	0

conclusion: neither

(ii)

X	Y	P	Q	$P \rightarrow Q$
0	0	0	1	1
0	1	1	0	0
1	0	1	0	0
1	1	1	0	0

conclusion: neither

(iii)

X	Y	P	Q	$P \rightarrow Q$
0	0	1	1	1
0	1	1	1	1
1	0	0	0	1
1	1	1	1	1

conclusion: tautology

(iv)

X	Y	P	Q	$P \rightarrow Q$
0	0	1	1	1
0	1	1	1	1
1	0	1	1	1
1	1	0	0	1

conclusion: tautology

(v)

X	Y	Z	P	Q	$P \rightarrow Q$
0	0	0	0	0	1
0	0	1	0	0	1
0	1	0	0	0	1
0	1	1	0	1	1
1	0	0	0	1	1
1	0	1	1	1	1
1	1	0	1	1	1
1	1	1	1	1	1

conclusion: tautology

(vi)

X	Y	P	Q	$P \rightarrow Q$
0	0	1	1	1
0	1	1	1	1
1	0	0	1	1
1	1	1	0	0

conclusion: neither

(vii)

(viii)

2. (i)

(ii)

(iii)

3. (a) (i)

(ii)

(iii)

(b) (i)

(ii)

(iii)

4. (i)

(ii)

(iii)

(iv)

(v)

(vi)

(vii)

(viii)

5. (a)

(b)

(c)

6. (a)
- $2^{\emptyset}$
- $2^{\{0\}}$
- $2^{\{0\} \cup \{1\}}$
- $2^{\{\emptyset, 0, 1\}}$
- $2^{2^{2^{\{0,1\}}}}$

(b) (i)

(ii)