10

Logic and proof

Test 1 Friday 11th October 12.20 to 13.10

NAME: (please PRINT)

Circle one of the following:

MATHS CS OTHER

This test is worth 10% of your final grade. It is a closed book test. Full answers should be written in the spaces provided. University rules about cheating apply. The test is designed to last no more than 15 minutes but you can stay the whole 50 minutes if you wish. Show all working. **There are 5 questions each worth two marks.**

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1. Draw truth-tables for each of the following wff.
   (1) $p \oplus q$.
   (2) $p \rightarrow q$.
   (3) $p \wedge q$.
   (4) $p \leftrightarrow q$.

[$\frac{1}{2}$] each part

p	q	$p \oplus q$	$p \rightarrow q$	$p \wedge q$	$p \leftrightarrow q$
T	T	F	T	T	T
T	F	T	F	F	F
F	T	T	T	F	F
F	F	F	T	F	T

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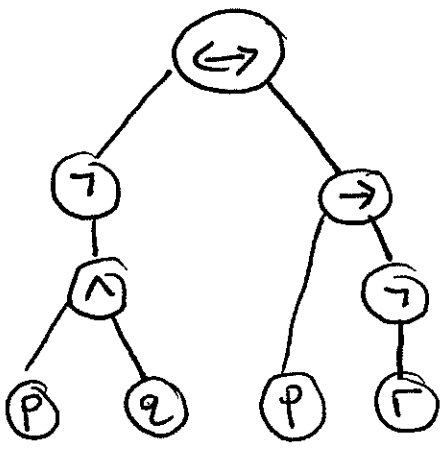
2. Draw the parse tree of $\neg(p \wedge q) \leftrightarrow (p \rightarrow \neg r)$.



[2]

3. Draw the truth-table for $(p \oplus q) \leftrightarrow ((p \vee q) \wedge \neg(p \wedge q))$.

p	q	$(p \oplus q) \leftrightarrow ((p \vee q) \wedge \neg(p \wedge q))$
T	T	T
T	F	T
F	T	T
F	F	T

[2]

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4. Draw up the truth-table for the following wff

$$(p \rightarrow q) \rightarrow r.$$

[2]

p	q	r	$(p \rightarrow q) \rightarrow r$
T	T	T	T
T	T	F	F
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	F
F	F	T	T
F	F	F	F

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5. Draw up the truth-table for the following wff

$$\neg(p \wedge q) \leftrightarrow (\neg p \vee \neg q).$$

p	q	$\neg(p \wedge q) \leftrightarrow (\neg p \vee \neg q)$
T	T	T
T	F	T
F	T	T
F	F	T

[2]