Logic (2001)

Question 3

(a) (i) Draw a logic network that accepts independent inputs p and q and gives as output $\neg p \wedge (p \vee q)$. Label your diagram to show the symbolic output after each gate. [4]

(ii) Make a table to show the truth value of the output from the network corresponding to each combination of truth values of p and q. [2]

Logic (2001)

Logic (2001)

(b) (i) Construct the truth table for the proposition $p \to q$. [2]

(ii) Let n be an element of the set $\{1, 2, 3, 4, 5, 6, 7\}$. Let p, q be the propositions

$$p\text{: } n \text{ is even}; \quad q\text{: } n > 4\,.$$

Find the values of n for which $p \to q$ is true. [2]

Logic (2001)

Logic (BLANK)

Logic (2003)

Question 3 (a) Let n be an element of the set $\{10, 11, 12, 13, 14, 15, 16, 17, 18, 19\}$, and p and q be the propositions:

$$p : n is even, \quad q : n>15.$$

Logic (2003)

Draw up truth tables for the following statements and find the values of n for which they are true:

(i) (i) $p \vee \neg q$ (ii) $\neg p \wedge q$

(ii) Use truth tables to find a statement that is logically equivalent to $\neg p \rightarrow q$.

[6]

Logic (2003)

(b) Let p, q be the following propositions:

$$p : thisappleisred, \quad q : thisappleisripe.$$

Express the following statements in words as simply as you can:
(i) $p \to q$ (ii) $p \wedge \neg q$.

Logic (2003)

Express the following statements symbolically:

(iii) This apple is neither red nor ripe.

(iv) If this apple is not red it is not ripe. [4]

Logic (BLANK)

Logic (2007)

Question 3 (a) Let n be a positive integer and p and q be the following propositions:

$$\begin{aligned} p &: n \leq 12 \\ q &: nisodd. \end{aligned}$$

(i) Express each of the three following compound propositions concerning positive integers symbolically by using p, q and appropriate logical symbols.

$$\begin{aligned} n &\leq 12andniseven. \\ ifn &\leq 12thenniseven \\ n &> 12andnisodd. \end{aligned}$$

Logic (2007)

Logic (BLANK)

Logic (2007)

(ii) Construct the truth table for the statement $q \to p$. Hence find a value of n that makes this statement false.

(iii) Write in logical symbols the contrapositive of the statement:

$$ifnisoddthenn \leq 12.$$

[6]

Logic (2007)

(b) Construct a logic network that accepts as inputs p and q, which may independently have the value 0 or 1, and gives as final output

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

Show the truth table for this output and hence give a simple expression (without using negation) that is equivalent to $\neg(\neg p \wedge q)$. [4]

Logic (2007)

Logic (20XX)

Question 3

(a) Let $S = \{10, 11, 12, 13, 14, 15, 16, 17, 18, 19\}$ and let p, q be the following propositions concerning the integer $n \in S$.

$$p \; : \quad n \text{ is a multiple of two}$$
$$q \; : \quad n \text{ is a multiple of three.}$$

i. For each of the following compound statements find the set of values n for which it is true.

$$p \wedge q; \quad p \vee q; \quad \neg p \oplus q$$

Logic (20XX)

ii. Express the following statement using logic symbols.

n is not a multiple of either two or three.

iii. List the elements of S which are in the truth set for the statement in (ii).

[6]

Logic (20XX)

(b) (i) Let p and q be propositions. Use truth tables to prove that

$$p \rightarrow q \equiv \neg q \rightarrow \neg p.$$

Logic (20XX)

(ii) Write the contrapositive of the following statement concerning an integer n.

If the last digit of n is 0, then n is divisible by 5.

[4]

Logic (20YY)

Question 3

Let p, q and r be the following propositions concerning integers n.

$$\begin{aligned} p &: \quad n \text{ is a multiple of two} \\ q &: \quad n < 20 \\ r &: \quad n \leq 20. \end{aligned}$$

(a) List the truth set of the compound proposition $\neg q \wedge p$. [2]

Logic (20YY)

(b) Express each of the following statements using the propositions p, q and r and logical symbols.

i. n is an integer less than 20 which is even;

ii. n is an integer larger than 20 which is odd;

iii. $n = 20$. [3]

Logic (20YY)

(c) i. Use truth tables to prove that

$$p \to (q \vee r) \equiv (\neg q \wedge \neg r) \to \neg p.$$

ii. Write in plain English the contrapositive of the statement

"If n is a positive integer and $n < 2$ then $n = 1$".

[5

Logic (BLANK)