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MATH 1152 ASSIGNMENT 1 SOLUTIONS

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NUMBER [1]

[i] We can re-write the proposition as the following :

$$\begin{aligned} a : & \sim p \implies q \\ b : & \sim r \implies \sim q \\ c : & \sim r \end{aligned}$$

METHOD 1:

We need all of the three premises to all have truth value **T** in the first case.
Thus , $\sim r$ is true when r is false.

In the second premise , since $\sim r$ is true this means that $\sim q$ is true , since we need $\sim r \implies \sim q$ to be true. This q is false.

Also , the statement p is taken as false since q is false.

p	q	r	$p \longrightarrow q$	$\sim r \longrightarrow \sim q$	$\sim r$	Premises	$\sim p$
F	F	F	T	T	T	T	T

Hence from the shortened truth table seen above , the conclusion is valid and logically consistent with the premises.

METHOD 2 : We can set up the entire truth table and test , $a \wedge b \wedge c \longrightarrow d$

p	q	r	$p \implies q$	$\sim r \implies \sim q$	$\sim r$	$\sim q$	$a \wedge b \wedge c$	$\sim p$	$a \wedge b \wedge c \implies d$
T	T	T	T	T	F	F	F	F	T
T	T	F	T	F	T	F	F	F	T
T	F	T	F	T	F	T	F	F	T
T	F	F	F	T	T	T	F	F	T
F	T	T	T	T	F	F	F	T	T
F	T	F	T	F	T	F	F	T	T
F	F	T	T	T	F	T	F	T	T
F	F	F	T	T	T	T	T	T	T

Since $a \wedge b \wedge c \longrightarrow d$ is a tautology , the conclusion is logically consistent with the propositions.

NUMBER [2]

p : Tom reads the paper

q : Tom watches TV

r : Tom jogs daily

(a) $p \wedge q$ [3 marks]

(b) $p \vee r$ [3 marks]

(c) $p \implies \sim q$ [3 marks]

(d) $p \iff r$ [3 marks]

(e) $\sim (r \implies p)$ [3 marks]

(f) $(q \vee r) \wedge \sim (q \wedge r)$ [3 marks]

NUMBER [3]

(i) Whenever Tom reads the papers and watches TV , he jogs daily. [4 marks]

(ii) It is not the case that Tom reads the papers if and only if he watches TV. [4 marks]

(iii) If Tom neither reads the papers nor watches TV then he jogs daily. [4 marks]

(iv) If Tom doesn't read the papers or he doesn't watch TV then he jogs daily. [4 marks]

- (v) If Tom reads the papers then either he watches TV or jogs daily. [4 marks]
- (vi) It is not the case that if Tom reads the papers , he would watch TV when he has jogged. [4 marks]
- (vii) Tom reads the papers , watches TV and doesn't jog daily. [4 marks]
- (viii) Each day once Tom reads the papers , he decides to watch TV which means that it is time to jog. [4 marks]

NUMBER [4]

- (a) I am not thirsty. [3 marks]
- (b) I am right and you are right. (Both of us are right) [3 marks]
- (c) There is a fire engine which is not real. [3 marks]
- (d) All triangles are not equilateral. [3 marks]
- (e) Somebody knows me. [3 marks]
- (f) All elephants are real. [3 marks]

NUMBER [5]

Let a , b , c , be propositions . We construct the following truth table:

a	b	c	$a \wedge c$	$(a \wedge b) \rightarrow c$	$b \implies c$	$a \rightarrow (b \rightarrow c)$
T	T	T	T	T	T	T
T	T	F	T	F	F	F
T	F	T	F	T	T	T
T	F	F	F	T	T	T
F	T	T	F	T	T	T
F	T	F	F	T	F	T
F	F	T	F	T	T	T
F	F	F	F	T	T	T
1	2	3	4	5	6	7

Using columns five (5) and seven (7) , the statements are equivalent.

$$\text{ie. } (a \wedge b) \rightarrow c \equiv a \rightarrow (b \rightarrow c)$$

[14 marks]

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