STUDENT'S DECLARATION OF ORIGINALITY

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Course Code: AAMS3184

Course Title: Discrete Mathematics

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DATE: 3/3/2022

1. $S \equiv [(p \vee q) \wedge (\sim q \vee r)] \rightarrow (p \vee r)$

1.(a)

p	q	r	~q	p∨q	~q∨r	p∨r	(p∨q)∧(~q∨r)	S	
0	0	0	1	0	1	0	0	1	
0	0	1	1	0	1	1	0	1	
0	1	0	0	1	0	0	0	1	
0	1	1	0	1	1	1	1	1	✓
1	0	0	1	1	1	1	1	1	✓
1	0	1	1	1	1	1	1	1	✓
1	1	0	0	1	0	1	0	1	
1	1	1	0	1	1	1	1	1	✓

1.(b) ~~PDNF of $S \equiv (\sim p \wedge \sim q \wedge \sim r) \vee (\sim p \wedge \sim q \wedge r) \vee (\sim p \wedge q \wedge \sim r) \vee (\sim p \wedge q \wedge r) \vee (p \wedge q \wedge r)$~~

PDNF of $S \equiv (\sim p \wedge q \wedge r) \vee (p \wedge \sim q \wedge \sim r) \vee (p \wedge \sim q \wedge r) \vee (p \wedge q \wedge r)$

PCNF of $S \equiv (p \vee q \vee r) \wedge (p \vee q \vee \sim r) \wedge (p \vee \sim q \vee r) \wedge (\sim p \vee \sim q \vee r)$

2.(a) ~~For~~ $\exists x \in$ real number $\exists$, $\forall m \in \mathbb{Z}$, $m < x$.

2.(b) $\forall x \in$ planar map, $\exists y \in$ colored $\exists$ x had at least 5 colors.

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AAMS 3184 DATE: 2/3/2022

3. $q \to \sim(b \wedge \sim c) \equiv (\sim q \vee \sim(b \wedge \sim c)$
$\equiv \sim a \vee \sim b \vee c$ or $\sim a \vee \sim(b \wedge \sim c)$

converse : $\sim(b \wedge \sim c) \vee \sim a$

Inverse : $a \vee (b \wedge \sim c)$

contrapositive : $(b \wedge \sim c) \vee a$

4. $p \vee r$ $p \vee q$ $\therefore q \vee r$

p	q	r	① $p \vee r$	② $p \vee q$	③ $q \vee r$
0	0	0	0	0	0
0	0	1	1	0	1
0	1	0	0	1	1
0	1	1	1	1	1
1	0	0	1	1	0
1	0	1	1	1	1
1	1	0	1	1	1
1	1	1	1	1	1

$\therefore$ This argument is valid.
The validity of the argument follows the result from row 4, 6, 7, 8.

5. $[p \to (q \to r)]$
$\equiv [\sim p \vee (\sim q \vee r)]$
$\equiv \sim p \vee \sim q \vee r$

$[(p \wedge q) \to r]$
$\equiv [\sim(p \wedge q) \vee r]$
$\equiv \sim p \vee \sim q \vee r$

$\therefore$ They are logical equivalence.

KANG HONG
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AAMS 3184

DATE: 3/3/2022

6. (a) $\forall y > 25, y \in Z, \sqrt{y-25} = \sqrt{y-5}$

$\sqrt{y-25} = 0$
$y - 25 = 0$
$y = 25$

,

$\sqrt{y-5} = 0$
$\sqrt{y} = 5$
$y = 25$

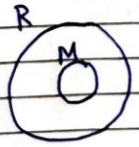
$\therefore$ True

6. (b) $\forall x \in Z, \exists y \in Z \ni 3xy = 24$

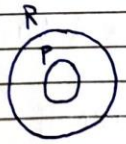
$\therefore$ False

7. Let M = set of mathematicians
P = set of physicits
R = set of rational people.

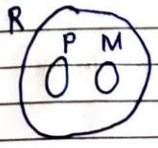
Major premise

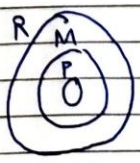


Minor premise



Possible conclusion





$\therefore$ Hence, the argument is invalid.