COL703 Quiz 2

Sreemanti Dey

TOTAL POINTS

2 / 3

QUESTION 1

1 1 / 1

- ✓ **+ 1 pts** Correct
- **+ 0.5 pts** Partially Correct
- **+ 0 pts** Incorrect/Not attempted

QUESTION 2

2 0.5 / 1

- **+ 1 pts** Correct
- ✓ **+ 0.5 pts** Partially Correct
- **+ 0 pts** Incorrect/Not attempted

QUESTION 3

3 0.5 / 1

- **+ 1 pts** Correct
- ✓ **+ 0.5 pts** Partially Correct
- **+ 0 pts** Incorrect/Not attempted

how did you get {not a}. incomplete steps

1 **1 / 1**

- ✓ **+ 1 pts** Correct
- **+ 0.5 pts** Partially Correct
- **+ 0 pts** Incorrect/Not attempted

2 **0.5 / 1**

- \+ **1 pts** Correct
- ✓ + **0.5 pts** **Partially Correct**
- \+ **0 pts** Incorrect/Not attempted

3 **0.5 / 1**

+ **1 pts** Correct

✓ + **0.5 pts** **Partially Correct**

+ **0 pts** Incorrect/Not attempted

how did you get {not a}. incomplete steps

Quiz 2 *(Aug 29, Marks: 3, Duration: 25 mins)* **COL703, Aug-Nov 2022**

Name: Sreemanti Dey **Entry No.:** 2020CS10393

1. **[1 marks]** Given the premises $(p \to q)$ and $(r \to s)$, use resolution to prove the conclusion $(p \vee r \to q \vee s)$.

2. **[1 marks]** Prove that a disjunction of literals $l_1, l_2, \ldots, l_m$ is valid if and only if there are $1 \leq i, j \leq m$ such that l_i is $\neg l_j$.

3. **[1 marks]** Consider the following popular puzzle. When asked for the ages of her three children, Mrs. Baker says that Alice is her youngest child if Bill is not her youngest child, and that Alice is not her youngest child if Carl is not her youngest child. Encode these facts, and the necessary background knowledge that only one of the three children can be her youngest child, into propositional logic formulas. Use propositions a, b and c to denote that Mrs. Bakers youngest child is Alice, Bill and Carl, respectively. Show with resolution that Bill is her youngest child.

3) $\neg b \to a$, $\neg c \to \neg a$, $a \vee b \vee c$, $\neg(a \wedge b \wedge c)$, $\neg(a \wedge b)$, $\neg(b \wedge c)$, $\neg(c \wedge a)$

$\{b \vee a\}$, $\{c, \neg a\}$,

$\{\{b, a\}, \{c, \neg a\}, \{a, b, c\}, \{\neg a, \neg b, \neg c\}, \{\neg a, \neg b\}, \{\neg b, \neg c\}, \{\neg c, \neg a\}\}$

$= \{\{b, c\}, \{a, b, c\}, \{\neg a, \neg b, \neg c\}, \{\neg a\}, \{\neg b, \neg c\}\}$

$= \{\{b, c\}, \{\neg a, \neg b, \neg c\}, \{\neg b, \neg c\}\}$

$= \{b\}$

1) $p \to q$

$r \to s$

$(\neg p \vee q)$ $(\neg r \vee s)$

$\{\{\neg p, q\}, \{\neg r, s\}\}$

$\{\{\neg p, q\}, \{\neg r, s\}, \{r, \neg r\}, \{\neg p, \neg r, p\}\}$

$\{\neg p, r\}$

Conclusion

$p \vee r \to q \vee s$

$\neg(p \vee r) \vee (q \vee s) = \{\neg(p \vee r), \vee (q \vee s)\}$

$= ((\neg p \wedge \neg r) \vee (q \vee s))$

$= (((\neg p \wedge \neg r) \vee q) \vee ((\neg p \wedge \neg r) \vee s))$

$= ((\neg p \vee q) \wedge (\neg r \vee q)) \vee ((\neg p \vee s) \wedge (\neg r \vee s))$

$= (\neg p \vee q)$

2) $l_1 \vee l_2 \ldots \vee l_m$ is valid

~~atleast one~~ means a proof of it exists

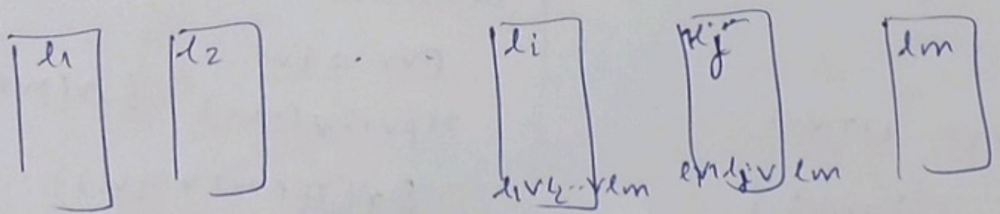
i.e. $l_1 \vee l_2 \ldots \vee l_m$ is always true

$\vdash l_1 \vee l_2 \vee \ldots \vee l_m$

~~This is only always true~~ if

$\Rightarrow$ If $l_i = \neg l_j$, then $\vdash l_1 \vee l_2 \ldots \vee l_i \vee \ldots \neg l_i \vee l_m$
true

$\Leftarrow$ $\vdash l_1 \vee l_2 \ldots \vee l_m$ is valid



hence from truth table argument, we can say
$\exists$ l_i and l_j such that $l_i = \neg l_j$.