COMP-SCI 5552A Formal Software Specification Solution for Home Work 3

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1. (20 points) Derive $(A \lor B) \Rightarrow \forall C \cdot \exists D \cdot (\neg C \land D)$.

Solution:

$$wff \Rightarrow wff \ op \ wff$$

$$\Rightarrow (wff) \ op \ wff$$

$$\Rightarrow (wff \ op \ wf) \ op \ wff$$

$$\Rightarrow (A \lor B) \ op \ (wff)$$

$$\Rightarrow (A \lor B) \ op \ (quantified\_wff)$$

$$\Rightarrow (A \lor B) \ op \ quantifier.wff$$

$$\Rightarrow (A \lor B) \ op \ \forall variable.wff$$

$$\Rightarrow (A \lor B) \ op \ \forall VARNAME.wff$$

$$\Rightarrow (A \lor B) \ op \ \forall C.wff$$

$$\Rightarrow (A \lor B) \ op \ \forall C.quantified\_wff$$

$$\Rightarrow (A \lor B) op \ \forall C.quantifier.wff$$

$$\Rightarrow (A \lor B) \ op \ \forall C.\exists variable.wff$$

$$\Rightarrow (A \lor B) op \ \forall C.\exists VARNAME.(wff)$$

$$\Rightarrow (A \lor B) \ op \ \forall C.\exists D.(wff \ op \ wff)$$

$$\Rightarrow (A \lor B) \ op \ \forall C.\exists D.(\neg wff \ op \ wff)$$

$$\Rightarrow (A \lor B) \ op \ \forall C..\exists D.(\neg C \ op \ D)$$

$$\Rightarrow (A \lor B) \ op \ \forall C.\exists D.(\neg C \land D)$$

$$\Rightarrow (A \lor B) \Rightarrow \forall C.\exists D.(\neg C \land D)$$

2. (20 points) Derive ∃A·(A∨∀C·(B∧¬C)).

Solution:

$$wff \Rightarrow quantified\_wff$$

$$\Rightarrow quantifier.wff$$

$$\Rightarrow \exists variable.wff$$

$$\Rightarrow \exists VARNAME.wff$$

$$\Rightarrow \exists A.wff$$

$$\Rightarrow \exists A.(wff)$$

$$\Rightarrow \exists A.(wff\ op\ wff)$$

$$\Rightarrow \exists A.(wff\ op\ quantified\_wff\ )$$

$$\Rightarrow \exists A.(wff\ op\ quantifier.wff)$$

$$\Rightarrow \exists A.(wff\ op\ \forall variable.wff)$$

$$\Rightarrow \exists A.(wff\ op\ \forall VARNAME.wff)$$

$$\Rightarrow \exists A.(wff\ op\ \forall C.wff)$$

$$\Rightarrow \exists A.\big(wff\ op\ \forall C.(wff\ op\ wff)\big)$$

$$\Rightarrow \exists A.\big(wff\ op\ \forall C.(wff\ op\ \neg wff)\big)$$

$$\Rightarrow \exists A.\big(wff\ op\ \forall C.(wff\ op\ \neg C)\big)$$

$$\Rightarrow \exists A.(wff\ op\ \forall C.(B\ \wedge\ \neg C))$$

$$\Rightarrow \exists A.(wff\ \vee\ \forall C.(B\ \wedge\ \neg C))$$

$$\Rightarrow \exists A.(A\ \vee\ \forall C.(B\ \wedge\ \neg C))$$