Logics for Artificial Intelligence
Homework 3/10
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Skolemization

A

1 $\neg\exists_x(P_x \wedge \neg Q_x \wedge \forall_y(R_{yy} \rightarrow S_{xy}))$
2 $\forall\neg(P_x \wedge \neg Q_x \wedge \forall_y(\neg R_{yy} \vee S_{xy}))$
3 $\forall_x(\neg P_x \vee Q_x \vee \neg\forall_y(\neg R_{yy} \vee S_{xy}))$
4 $\forall_x(\neg P_x \vee Q_x \vee \exists_y\neg(\neg R_{yy} \vee S_{xy}))$
5 $\forall_x\exists_y(\neg P_x \vee Q_x \vee (R_{yy} \wedge \neg S_{xy}))$
6 $\forall_x\exists_y((\neg P_x \vee Q_x \vee R_{yy}) \wedge (\neg P_x \vee Q_x \vee \neg S_{xy}))$ PCNF $\{{}^{f_x}/_{y}\}$
7 $\forall_x((\neg P_x \vee Q_x \vee R_{f_x f_x}) \wedge (\neg P_x \vee Q_x \vee \neg S_{x f_x}))$ SNF

B

1 $\exists_x(P_x \wedge ((\forall_y(Q_y \rightarrow \neg R_{xy})) \rightarrow \neg\exists_z R_{zx}))$
2 $\exists_x(P_x \wedge (\neg(\forall_y(\neg Q_y \vee \neg R_{xy})) \vee \neg\exists_z R_{zx}))$
3 $\exists_x(P_x \wedge ((\exists_y\neg(\neg Q_y \vee \neg R_{xy})) \vee \forall_z\neg R_{zx}))$
4 $\exists_x(P_x \wedge (\exists_y(Q_y \wedge R_{xy}) \vee \forall_z\neg R_{zx}))$
5 $\exists_x\exists_y\forall_z(P_x \wedge ((Q_y \wedge R_{xy}) \vee \neg R_{zx}))$
6 $\exists_x\exists_y\forall_z(P_x \wedge (Q_y \vee \neg R_{zx}) \wedge (R_{xy} \vee \neg R_{zx}))$ PCNF $\{{}^{a}/_{x},\ {}^{b}/_{y}\}$
7 $\forall_z(P_a \wedge (Q_b \vee \neg R_{za}) \wedge (R_{ab} \vee \neg R_{za}))$ SNF

C

1 $(\exists_x(P_x \wedge \forall_y(R_{xy} \rightarrow \neg Q_y))) \rightarrow \neg\forall_x\forall_y T_{xy}$
2 $\neg(\exists_x(P_x \wedge \forall_y(\neg R_{xy} \vee \neg Q_y))) \vee \neg\forall_{x'}\forall_{y'} T_{x'y'}$
3 $(\forall_x\neg(P_x \wedge \forall_y(\neg R_{xy} \vee \neg Q_y))) \vee \exists_{x'}\exists_{y'}\neg T_{x'y'}$
4 $(\forall_x(\neg P_x \vee \neg\forall_y(\neg R_{xy} \vee \neg Q_y))) \vee \exists_{x'}\exists_{y'}\neg T_{x'y'}$
5 $(\forall_x(\neg P_x \vee \exists_y\neg(\neg R_{xy} \vee \neg Q_y))) \vee \exists_{x'}\exists_{y'}\neg T_{x'y'}$
6 $(\forall_x(\neg P_x \vee \exists_y(R_{xy} \wedge Q_y))) \vee \exists_{x'}\exists_{y'}\neg T_{x'y'}$
7 $(\forall_x\exists_y(\neg P_x \vee (R_{xy} \wedge Q_y))) \vee \exists_{x'}\exists_{y'}\neg T_{x'y'}$
8 $(\forall_x\exists_y((\neg P_x \vee R_{xy}) \wedge (\neg P_x \vee Q_y))) \vee \exists_{x'}\exists_{y'}\neg T_{x'y'}$
9 $\forall_x\exists_y\exists_{x'}\exists_{y'}(((\neg P_x \vee R_{xy}) \wedge (\neg P_x \vee Q_y)) \vee \neg T_{x'y'})$
10 $\forall_x\exists_y\exists_{x'}\exists_{y'}((\neg P_x \vee R_{xy} \vee \neg T_{x'y'}) \wedge (\neg P_x \vee Q_y \vee \neg T_{x'y'}))$ PCNF $\{{}^{f_x}/_{y},\ {}^{g_x}/_{x'},\ {}^{h_x}/_{y'}\}$
11 $\forall_x((\neg P_x \vee R_{x f_x} \vee \neg T_{g_x h_x}) \wedge (\neg P_x \vee Q_{f_x} \vee \neg T_{g_x h_x}))$ SNF

D

1	$\exists_x \forall_y (\neg \exists_z P_z \to \forall_w (T_{wx} \to (Q_x \vee R_{wy})))$	
2	$\exists_x \forall_y (\neg\neg \exists_z P_z \vee \forall_w (\neg T_{wx} \vee (Q_x \vee R_{wy})))$	
3	$\exists_x \forall_y \exists_z \forall_w (P_z \vee (\neg T_{wx} \vee (Q_x \vee R_{wy})))$	
4	$\exists_x \forall_y \exists_z \forall_w (P_z \vee \neg T_{wx} \vee Q_x \vee R_{wy})$	PCNF $\{{}^{a}/_{x},\ {}^{f_y}/_{z}\}$
5	$\forall_y \forall_w (P_{f_y} \vee \neg T_{wa} \vee Q_a \vee R_{wy})$	SNF