1. $[(Book(H) \wedge Book(P))] \wedge \neg Sad(A)] \vee [\neg (Book(H) \wedge Book(P)) \wedge Sad(A)]$ ①

2. $\exists x \forall y (x \neq Ali) \wedge [like(Ali,y) \rightarrow like(x,y)] \wedge (x = Sina) \wedge [\forall z (like(Ali,y)$
$\rightarrow like(z,y))_{x \rightarrow z \rightarrow x}]$

time
↑
3. $(\exists x \exists t \, human(x) \wedge Eat(x,t)) \wedge \neg (\forall x \forall t \, human(x) \rightarrow Eat(x,t))$

4. $\forall r \, Match(r) \rightarrow \exists x \exists y \, player(x) \wedge player(y) \wedge (win(x) \vee win(y))$

5. $\neg (\forall c \, Course(c) \rightarrow Useless(c) \vee hard(c))$

6. $\forall x \, Safe(x) \rightarrow \neg Peroyd(x) \wedge \neg Peykan(x)$

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1. $\forall x (Buy(x) \rightarrow \exists y (Own(x,y) \wedge (mouse(y) \vee Grocery(y))))$ تبدیل به cnf   ②

$\rightarrow \forall x (\neg Buy(x) \vee \exists y (Own(x,y) \wedge (mouse(y) \vee Grocery(y))))$

$\rightarrow [\neg Buy(x) \vee (Own(x, F(x)) \wedge (mouse(F(x)) \vee Grocery(F(x))))]$

$\rightarrow [\neg Buy(x) \vee Own(x, F(x))] \wedge [\neg Buy(x) \vee mouse(F(x)) \vee Grocery(F(x))]$

2. $\forall x (cat(x) \rightarrow \exists y (mouse(y) \wedge Chase(x,y)))$ تبدیل به cnf

$\rightarrow \forall x (\neg cat(x) \vee \exists y (mouse(y) \wedge chase(x,y)))$

$\rightarrow [\neg cat(x) \vee (mouse(F(x)) \wedge chase(x, F(x)))] \rightarrow [\neg cat(x) \vee mouse(F(x))] \wedge [\neg cat(x) \vee chase(x, F(x))]$

3. $Buy(Peter)$
$\rightarrow Buy(Peter)$

4. $\forall x \forall y (Own(x,y) \wedge mouse(y) \rightarrow \forall a \forall b (mouse(a) \wedge chase(b,a)$
$\rightarrow Hate(x,b))$

$\rightarrow \forall x \forall y [(\neg Own(x,y) \vee \neg mouse(y)) \vee \forall a \forall b ((\neg mouse(a) \vee \neg chase(b,a))$
$\vee Hate(x,b))]$

$\rightarrow [\neg Own(x,y) \vee \neg mouse(y) \vee \neg mouse(a) \vee \neg chase(b,a) \vee Hate(x,b)]$

$\delta 4.$ $\exists n\ (\text{cat}(n) \wedge \text{Own}(\text{Alex}, n))$

$\llcorner$ $\{\text{cat}(c) \wedge \text{Own}(\text{Alex}, c)\}$

$4.$ $\forall n\ \forall y\ \forall z\ (\text{Own}(y,z) \wedge \text{Hate}(n,z) \rightarrow \neg \text{friend}(n,y))$

$\llcorner$ $[\neg \text{Own}(y,z) \vee \neg \text{Hate}(n,z) \vee \neg \text{friend}(n,y)]$

$V.$ $((\neg \exists n\ (\text{Grocery}(n) \wedge \text{Own}(\text{Peter}, n)) \rightarrow \neg \text{friend}(\text{Peter}, \text{Alex}))$

$\llcorner$ $\exists n\ (\text{Grocery}(n) \wedge \text{Own}(\text{Peter}, n)) \vee \neg \text{friend}(\text{Peter}, \text{Alex})$

$\llcorner$ $\{((\text{Grocery}(y) \vee \neg \text{friends}(\text{Peter}, \text{Alex})) \wedge (\text{Own}(\text{Peter}, y) \vee \neg \text{friend}(\text{Peter}, \text{Alex}))\}\ (\alpha)$

$\Rightarrow \neg \alpha : [(\neg \text{Grocery}(y) \wedge \text{friend}(\text{Peter}, \text{Alex})) \vee (\neg \text{Own}(\text{Peter}, y) \wedge \text{friend}(\text{Peter}, \text{Alex}))]$

$\textcircled{2}$

$1 \rightarrow$ تابع نداريم $\times$

$2 \rightarrow$ $\begin{matrix} X = g(Y) \\ Y , f(x) \end{matrix} \} \Rightarrow \exists : f(g(Y))$ $\times$

$3 \rightarrow$ $\{n/b , z/a ,)(J)/w\}$

$4 \rightarrow$ $\text{brother}(y) = J$ $\times$

$\textcircled{3}$

$1:$ (درست است) در اينجا هميشه A درست $true$ نميشه

$2.$ $A = \text{true}, B = \text{true} \rightarrow \text{both}\ \text{true}$ $\Rightarrow$ بنابراين Valid نيست

$A = \text{true}, B = \text{false} \rightarrow \text{false}$

$3.$ $(\neg A \vee c) \wedge (\neg B \vee c) \equiv (\neg A \vee c) \wedge (\neg B \vee c)$ درست است

a → P: true
b → Q: true } $\xrightarrow{d}$ S: true
             b → Q: true } $\xrightarrow{c}$ U: true $\xrightarrow{f}$ G: true

a → P: true
c → R: true } $\xrightarrow{i}$ T: true $\xrightarrow{h}$ H: true
         a → P: true

$$Q = BC(Q) = BC(P \lor R \lor (M \lor N)) = BC(P) \lor BC(R) \lor (BC(M) \land BC(N)) \quad ④$$

$$= BC(A \land B) \lor (BC(A \lor C) \land BC(D)) = (BC(A) \land BC(B)) \lor ((BC(A) \lor BC(C)) \land True)$$

$$= (True \land BC(E)) \lor (True \lor BC(C)) = BC(E) \lor True = True$$

$\longleftarrow$