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Bscs-6F

AI- Assignment : 04

Q No. 1

(a)

False $\models$ True

It is a correct, because we know that if 1st premise is false in implication, preposition is true.

T.T

True	False	False $\models$ True
F	F	T
$\boxed{T}$	$\boxed{F}$	$\boxed{T}$

$\longrightarrow$ False $\rightarrow$ True = True.

(b)

True $\models$ False

It is a wrong because True $\rightarrow$ False = False.

T.T

False	True	True $\models$ False
$\boxed{F}$	$\boxed{T}$	$\boxed{F}$
T	T	T

$\longrightarrow$ T $\rightarrow$ F = False.

(c)

$(A \wedge B) \models (A \Leftrightarrow B)$

It is a correct because $A \leftrightarrow B$ gives tautology.

T.T

A	B	$A \wedge B$	$A \leftrightarrow B$	$(A \wedge B) \models (A \leftrightarrow B)$
F	F	F	T	T
F	T	F	F	T
T	F	F	F	T
T	T	T	T	T

(d)

$A \leftrightarrow B \models A \vee B$

It is wrong, because this is not gives tautology

T.T

A	B	$A \vee B$	$A \leftrightarrow B$	$(A \leftrightarrow B) \models A \vee B$
F	F	F	T	F
F	T	T	F	T
T	F	T	F	T
T	T	T	T	T

(e)

$A \leftrightarrow B \models \neg A \vee B$

It is correct, because it gives tatuology.

T.T

A	B	$\neg A$	$A \leftrightarrow B$	$\neg A \vee B$	$(A \leftrightarrow B) \models \neg A \vee B$
T	T	F	T	T	T
T	F	F	F	F	T
F	T	T	F	T	T
F	F	T	T	T	T

(f)

$(A \wedge B) \rightarrow C \models (A \rightarrow C) \vee (B \rightarrow C)$

It is a correct, because it gives valid solution.

$X = (A \wedge B) \rightarrow C \qquad Y = (A \rightarrow C) \vee (B \rightarrow C)$

T.T

A	B	C	$A \wedge B$	X	$A \rightarrow C$	$B \rightarrow C$	Y	$X \models Y$
T	T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	F	T
T	F	T	F	T	T	T	T	T
T	F	F	F	T	F	T	T	T
F	T	T	F	T	T	T	T	T
F	T	F	F	T	T	F	T	T
F	F	T	F	T	T	T	T	T
F	F	F	F	T	T	T	T	T

(g)

$(C \vee (\neg A \wedge \neg B)) \equiv ((A \rightarrow C) \wedge (B \rightarrow C))$

It is a correct, becouse it gives valid solution.

$X = C \lor (\neg A \land \neg B)$ $\quad$ $Y = (A \to C) \land (B \to C)$

T.T

A	B	C	¬A	¬B	X	A→C	B→C	Y	X≡Y
T	T	T	F	F	T	T	T	T	T
T	T	F	F	F	F	F	F	F	T
T	F	T	F	T	T	T	T	T	T
T	F	F	F	T	F	F	T	F	T
F	T	T	T	F	T	T	T	T	T
F	T	F	T	F	T	T	T	T	T
F	F	T	T	T	F	T	F	F	T
F	F	F	T	T	T	T	T	T	T

1h)

$(A \lor B) \land (\neg C \lor \neg D \lor E) \models (A \lor B)$

It is a correct, becouse it gives valid solution

$X = A \lor B$ $\quad$ $Y = (\neg C \lor \neg D \lor E)$ $\quad$ $Z = X \land Y$

T.T

A	B	C	D	E	¬C	¬D	X	Y	Z	Z⊨X
T	T	T	T	T	F	F	T	T	T	T
T	T	T	T	F	F	F	T	F	F	T
T	T	T	F	T	F	T	T	T	T	T
T	T	T	F	F	F	T	T	T	T	T
T	T	F	T	T	T	F	T	T	T	T
T	T	F	T	F	T	F	T	T	T	T
T	T	F	F	T	T	T	T	T	T	T
T	T	F	F	F	T	T	T	T	T	T
T	F	T	T	T	F	F	T	T	T	T
T	F	T	T	F	F	F	T	F	F	T
T	F	T	F	T	F	T	T	T	T	T
T	F	T	F	F	F	T	T	T	T	T
T	F	F	T	T	T	F	T	T	T	T
T	F	F	T	F	T	F	T	T	T	T
T	F	F	F	T	T	T	T	T	T	T
T	F	F	F	F	T	T	T	T	T	T
F	T	T	T	T	F	F	T	T	T	T
F	T	T	T	F	F	F	T	F	F	T
F	T	T	F	T	F	T	T	T	T	T
F	T	T	F	F	F	T	T	T	T	T
F	T	F	T	T	T	F	T	T	T	T
F	T	F	T	F	T	F	T	T	T	T
F	T	F	F	T	T	T	T	T	T	T
F	T	F	F	F	T	T	T	T	T	T

F	F	T	F	T	F	F	F	T	F	T
F	F	T	T	F	F	F	F	F	F	T
F	F	T	F	T	F	T	F	T	F	T
F	F	T	F	F	F	T	F	T	F	T
F	F	F	T	T	T	F	F	T	F	T
F	F	F	T	F	T	F	F	T	F	T
F	F	F	F	T	T	F	F	T	F	T
F	F	F	F	F	T	F	F	T	F	T

(ii)

$$(A\vee B)\wedge(\neg C\vee\neg D\vee E)\models(A\vee B)\wedge(\neg D\vee E)$$

$X=(A\vee B)$, $Y=(\neg C\vee\neg D\vee E)$, $Q=(\neg D\vee E)$, $P=X\wedge Q$, $Z=X\wedge Y$

It is not correct, because it gives not valid solution.

T.T

A	B	C	D	E	¬C	¬D	X	Y	Z	Q	P	Z ⊨ P
T	T	T	T	T	F	F	T	T	T	T	T	T
T	T	T	T	F	F	F	T	F	F	F	F	T
T	T	T	F	T	F	T	T	T	T	T	T	T
T	T	T	F	F	F	T	T	T	T	T	T	T
T	T	F	T	T	T	F	T	T	T	T	T	T
T	T	F	T	F	T	F	T	T	T	F	F	F
T	T	F	F	T	T	T	T	T	T	T	T	T
T	T	F	F	F	T	T	T	T	T	T	T	T
T	F	T	T	T	F	F	T	T	T	T	T	T
T	F	T	T	F	F	F	T	F	F	F	F	T
T	F	T	F	T	F	T	T	T	T	T	T	T
T	F	T	F	F	F	T	T	T	T	T	T	T
T	F	F	T	T	T	F	T	T	T	T	T	T
T	F	F	T	F	T	F	T	T	T	F	F	F
T	F	F	F	T	T	T	T	T	T	T	T	T
T	F	F	F	F	T	T	T	T	T	T	T	T
F	T	T	T	T	F	F	T	T	T	T	T	T
F	T	T	T	F	F	F	T	F	F	F	F	T
F	T	T	F	T	F	T	T	T	T	T	T	T
F	T	T	F	F	F	T	T	T	T	T	T	T
F	T	F	T	T	T	F	T	T	T	T	T	T
F	T	F	T	F	T	F	T	T	T	F	F	F
F	T	F	F	T	T	T	T	T	T	T	T	T
F	T	F	F	F	T	T	T	T	T	T	T	T
F	F	T	T	T	F	F	F	T	F	T	F	T
F	F	T	T	F	F	F	F	F	F	F	F	T
F	F	T	F	T	F	T	F	T	F	T	F	T
F	F	T	F	F	F	T	F	T	F	T	F	T
F	F	F	T	T	T	F	F	T	F	T	F	T
F	F	F	T	F	T	F	F	T	F	F	F	T
F	F	F	F	T	T	T	F	T	F	T	F	T
F	F	F	F	F	T	T	F	T	F	T	F	T

(j)

$(A \lor B) \land \neg(A \to B)$

It is correct, because it is satisfiable.

T.T

A	B	$A \lor B$	$A \to B$	$\neg(A \to B)$	$(A \lor B) \land \neg(A \to B)$
T	T	T	T	F	F
T	F	T	F	T	T
F	T	T	T	F	**F**
F	F	F	T	F	F

It is show that it is satisfy.

(k)

$(A \leftrightarrow B) \land (\neg A \lor B)$

It is correct, because it is satisfiable solution.

T.T

A	B	$\neg A$	$A \leftrightarrow B$	$\neg A \lor B$	$(A \leftrightarrow B) \land (\neg A \lor B)$
T	T	F	T	T	T
T	F	F	F	F	F
F	T	T	F	T	F
F	F	T	T	T	T

(i)

$(A \leftrightarrow B) \leftrightarrow C$

T.T

A	B	C	$(A \leftrightarrow B)$	$(A \leftrightarrow B) \leftrightarrow C$
T	T	T	T	T
T	T	F	T	F
T	F	T	F	F
T	F	F	F	T
F	T	T	F	F
F	T	F	F	T
F	F	T	T	T
F	F	F	T	F
			4	4

Both have same models.

Q No. 2

Smoke = S
Fire = F
Heat = H

(a)

$S \rightarrow S$

$\neg S \vee S$

T

$\boxed{\text{valid}}$

(b)

$S \rightarrow F$

$\neg S \vee F$

$\boxed{\text{satisfiable}}$

(c)

$(S \rightarrow F) \rightarrow (\neg S \rightarrow \neg F)$

$(\neg S \vee F) \rightarrow (\neg S \rightarrow \neg F)$

$\neg(\neg S \vee F) \vee (S \vee \neg F)$

$(S \wedge \neg F) \vee (S \vee \neg F)$

$(S \vee (S \vee \neg F)) \wedge (\neg F \vee (S \vee \neg F))$

$(S \vee S) \vee (S \vee \neg F) \wedge (\neg F \vee S)(\neg F \vee \neg F)$

$(S \vee \neg F) \wedge (S \vee \neg F)$

$(S \vee \neg F)$

$\boxed{\text{Satisfiable}}$

(d)

$S \vee F \vee \neg F$

$S \vee T$

S

$\boxed{\text{Valid}}$

(e)

$((S \wedge H) \rightarrow F) \leftrightarrow ((S \rightarrow F) \vee (H \rightarrow F))$

$(\neg(S \wedge H) \vee F) \leftrightarrow ((\neg S \vee F) \vee (\neg H \vee F))$

$((\neg S \vee \neg H) \vee F) \leftrightarrow ((\neg S \vee F) \vee (\neg H \vee F))$

$\underbrace{[((\neg S \vee \neg H \vee F) \rightarrow ((\neg S \vee F) \vee (\neg H \vee F))]}_{1} \wedge \underbrace{[((\neg S \vee F) \vee (\neg H \vee F)) \rightarrow ((\neg S \vee \neg H \vee F))]}_{2}$

From 1

$(S \wedge H \wedge \neg F) \vee ((\neg S \vee F) \vee (\neg H \vee F))$

$(S \wedge H \wedge \neg F) \vee (\neg S \vee \neg H \vee F)$

T

From 2

$\neg((\neg S \vee F) \vee (\neg H \vee F)) \vee (\neg S \vee \neg H \vee F)$

$\neg(\neg S \vee \neg H \vee F) \vee (\neg S \vee \neg H \vee F)$

T

Now,

$1 \wedge 2$

$T \wedge T$

T

$\boxed{\text{Valid}}$

(f)

$(S\to F)\to((S\wedge H)\to F)$

$(\neg S\vee F)\to(\neg(S\wedge H)\vee F)$

$\neg(\neg S\vee F)\vee((\neg S\vee\neg H)\vee F)$

$(S\wedge\neg F)\vee(\neg S\vee\neg H\vee F)$

$(S\vee\neg S)\vee(S\vee\neg H)\vee(S\vee F)\wedge(\neg F\vee\neg S)\vee(\neg F\vee\neg H)\vee(\neg F\vee F)$

$[(S\vee\neg H)\vee(S\vee F)\vee T)]\wedge((\neg F\vee\neg S)\vee(\neg F\vee\neg H)\vee T)$

$T\wedge T$

T

$\boxed{\text{Valid}}$

(g)

$Big\vee Dumb\vee(Big\to Dumb)$

$(Big\vee Dumb)\vee(\neg Big\vee Dumb)$

$(Big\vee\neg Big)\vee(Big\vee Dumb)\vee(Dumb\vee\neg Big)\vee(Dumb\vee Dumb)$

T

$\boxed{\text{Valid}}$

Q No.3

Food = F
Party = P
drinks = D

$$[(F\to P)\vee(D\to P)]\to[(F\wedge D)\to P]$$

(a)

$A=F\to P$, $B=D\to P$ $C=F\wedge D$

$X=C\to P$, $Y=(A\vee B)\to X$

T.T

F	P	D	A	B	C	X	AVB	Y
T	T	T	T	T	T	T	T	T
T	T	F	T	T	F	T	T	T
T	F	T	F	F	T	F	F	T
T	F	F	F	T	F	T	T	T
F	T	T	T	T	F	T	T	T
F	T	F	T	T	F	T	T	T
F	F	T	T	F	F	T	T	T
F	F	F	T	T	F	T	T	T

This is a valid statement.

(b)

Left side

$(F \to P) \vee (D \to P)$

$(\neg F \vee P) \vee (\neg D \vee P)$

$(\neg F \vee \neg D \vee P)$

Right side

$(F \wedge D) \to P$

$\neg(F \wedge D) \vee P$

$(\neg F \vee \neg D \vee P)$

L.H.S $\equiv$ R.H.S.

So, L.H.S $\to$ R.H.S is True.

(C)

$\overset{1}{(F \vee \neg F)} \wedge \overset{2}{(F \vee \neg D)} \wedge \overset{3}{(F \vee \neg P)} \wedge \overset{4}{(\neg P \vee \neg F)} \wedge \overset{5}{(\neg P \vee \neg D)} \wedge$
$\overset{6}{(D \vee \neg D)} \wedge \overset{7}{(D \vee \neg F)} \wedge \overset{8}{(D \vee \neg P)} \wedge \overset{9}{(\neg P \vee \neg F)} \wedge \overset{10}{(\neg P \vee \neg D)} \wedge \overset{11}{(\neg P)}$

Resolution.

12 $\to$ 2, 8 $\quad (F \vee \neg P)$

13 $\to$ 3, 7 $\quad (D \vee \neg P)$

14 $\to$ 4, 1 $\quad (\neg P \vee \neg F)$

15 $\to$ 5, 6 $\quad (\neg P \vee \neg P)$

16 $\to$ 9, 12 $\quad (\neg P \vee \neg P)$

17 $\to$ 10, 13 $\quad (\neg P \vee \neg P)$

18 $\to$ from (1) True

i.e. $(P \vee \neg P) = T$

Proved $\to$ (a)

Q No. 4

(a)

KB

1) $\neg W_{11}$
2) $\neg P_{11}$
3) B_{21}
4) S_{12}
5) $\neg B_{12}$
6) $S_{12} \rightarrow W_{13}$ or $\neg S_{12} \vee W_{13}$
7) $S_{12} \rightarrow W_{22}$ or $\neg S_{12} \vee W_{22}$
8) $B_{21} \rightarrow P_{31}$ or $\neg B_{21} \vee P_{31}$
9) $B_{21} \rightarrow P_{22}$ or $B_{21} \vee P_{22}$
10) $\neg B_{12} \rightarrow \neg P_{22}$ or $B_{12} \vee \neg P_{22}$
11) $\neg B_{12} \rightarrow \neg P_{13}$ or $B_{12} \vee \neg P_{13}$
12) $\neg B_{12} \rightarrow \neg P_{11}$ or $B_{12} \vee \neg P_{11}$
13) $\neg S_{21}$
14) $\neg S_{21} \rightarrow \neg W_{22}$ or $S_{21} \vee \neg W_{22}$

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b)

$KB \models \alpha_1$ $\because \alpha_1 = \neg P_{22}$

15 P_{22} Negate conclusion
16 $\neg P_{22}$ 10,5
17 $\cdot$ 15,16

So,

$KB \models \alpha_1$ is Prove.

c)

$KB \models \alpha_2$ $\because \alpha_2 = W_{13}$

15 W_{13} 6,4 modus Ponun