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BASIL ALI KHAN
20K-0477

ASSIGNMENT # 02.

Q#1

(a)
Proposition (true)

(b)
Proposition (False)

(c)
Proposition (True)

(d)
Proposition (False)

(e)
Not a proposition (contains variable)

(f)
Not a proposition (It is not declarative sentence)

Q#2

(a)
Not a proposition (It is not declarative sentence).

(b)
Not a proposition (Its a question).

(c)
Proposition (False)

(d)
Not a proposition (contains variable)

(e)
Proposition (False).

(f)
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Not a proposition (contains variable).

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Q#3

a) Mei doesnot have an MP3 player.
b) Isabelle makes more money than Mei.
c) Monica is taller than Moshe.
d) Ricardo is richer than Abby.

Q#4

a) Juan has more facebook friends than Janice.
b) Venkat is smarter than Quincy.
c) Paola drives more miles to school than Zelda.
d) Gloria sleeps longer than Briana.

Q#8

(a)
True

(b)
True.

(c)
False.

(d)
False.

(e)
False.

Q#9

(a)
False.

(b)
True.

(c)
True

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(d)

True

(e)

True

Q#10

a) $\neg p$

I didnot bought the lottery ticket this week.

b) $p \vee q$

Either I bought lottery ticket or I won the million doller Jackpot.

c) $p \rightarrow q$

If I bought the lottery ticket then I won the million doller Jackpot.

d) $p \wedge q$.

I bought a lottery ticket this week and I won a million dollar Jackpot

e) $p \leftrightarrow q$.

I bought a lotkey ticket this week if and only if I won a million doller Jackpot

f) $\neg p \rightarrow \neg q$.

If i dont bought a lotkey ticket this week, then I did not won million dollar Jackpot.

g) $\neg p \wedge \neg q$.

I donot bought a lotkey ticket the week and I didnot won million dollar.

h) $\neg p \vee (p \wedge q)$

I didnot bought a lottery ticket this week or I bought a lottery ticket this week and I won million dollar Jackpot.

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Q#13

a) $p \wedge q$

b) $p \wedge \neg q$

c) $\neg p \wedge \neg q$

d) $p \vee q$

e) $p \rightarrow q$ $p \rightarrow \neg q$

f) $(p \vee q) \wedge (\quad \rightarrow \quad)$

g) $p \leftrightarrow q$

Q#15

a) $\neg p$

b) $p \wedge \neg q$

c) $p \rightarrow q$

d) $\neg p \rightarrow \neg q$

e) $p \leftrightarrow q$

f) $q \wedge \neg p$

g) $q \rightarrow p$

Q#17

a) $r \wedge \neg p$

b) $(\neg p \wedge q) \wedge r$

c) $r \rightarrow (q \leftrightarrow p)$

d) $\neg q \wedge \neg p \wedge r$

e) $(q \rightarrow (\neg r \wedge \neg p)) \wedge \neg((\neg r \wedge \neg p) \rightarrow q)$

f) $(p \wedge r) \rightarrow q$

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Q#26

(a)
If you send me an email message, then I will remember to send you an ~~email~~ address.

(b)
Born in United States is sufficient to be a citizen of of this country.

(c)
If you keep your textbook, then it will be useful reference in you future courses.

(d)
If Redwings goalie plays well, then they will win the Stanley cup.

(e)
You get the job implies you had the best credentials.

(f)
If there is a storm, then the beech erodes.

(g)
A necessary condition to log on to server is to have a valid password.

(h)
You will reach the summit unless you begin climb eerly.

(i)
If you are among the first 100 customers, then you will get a free icecream cone.

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Q#36

a) $p \oplus q$

p	$p \oplus q$
T	F
F	F

b) $p \oplus \neg p$

p	$\neg p$	$p \oplus \neg p$
F	T	T
T	F	T

c) $p \oplus \neg q$

p	q	$\neg q$	$p \oplus \neg q$
T	T	F	T
T	F	T	F
F	T	F	F
F	F	T	T

d) $\neg p \oplus \neg q$

p	$\neg p$	q	$\neg q$	$\neg p \oplus \neg q$
T	F	T	F	F
T	F	F	T	T
F	T	T	F	T
F	T	F	T	F

e) $(p \oplus q) \vee (p \oplus \neg q) = X$

p	q	$\neg q$	$p \oplus q$	$p \oplus \neg q$	X
T	T	F	F	T	T
T	F	T	T	F	T
F	T	F	T	F	T
F	F	T	F	T	T

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f) $(p \oplus q) \wedge (p \oplus \neg q)$

$p \oplus q$	$p \oplus \neg q$	$p \oplus q \wedge p \oplus \neg q$
F	T	F
T	F	F
T	F	F
F	T	F

Q#39

a) $p \rightarrow (\neg q \vee r)$

p	q	r	$\neg q$	$\neg q \vee r$	$p \rightarrow (\neg q \vee r)$
T	T	T	F	T	T
T	T	F	F	F	F
T	F	T	T	T	T
T	F	F	T	T	T
F	T	T	F	T	T
F	T	F	F	F	T
F	F	T	T	T	T
F	F	F	T	T	T

b) $\neg p \rightarrow (q \rightarrow r)$

p	q	r	$q \rightarrow r$	$\neg p$	$\neg p \rightarrow (q \rightarrow r)$
T	T	T	T	F	T
T	T	F	F	F	T
T	F	T	T	F	T
T	F	F	T	F	T
F	T	T	T	T	T
F	T	F	F	T	F
F	F	T	T	T	T
F	F	F	T	T	T

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c) $(p \to q) \vee (\neg p \to r) = X$

p	q	r	$p \to q$	$\neg p$	$\neg p \to r$	X
T	T	T	T	F	T	T
T	T	F	T	F	T	T
T	F	T	F	F	T	T
T	F	F	F	F	T	T
F	T	T	T	T	T	T
F	T	F	T	T	F	T
F	F	T	T	T	T	T
F	F	F	T	T	F	T

d) $(p \to q) \wedge (\neg p \to r) = X$

$p \to q$	$\neg p \to r$	X
T	T	T
T	T	T
F	T	F
F	T	F
T	T	T
T	F	F
T	T	T
T	F	F

e) $(p \leftrightarrow q) \vee (\neg q \leftrightarrow r) = X$

p	q	r	$p \leftrightarrow q$	$\neg q$	$\neg q \leftrightarrow r$	X
T	T	T	T	F	F	T
T	T	F	T	F	T	T
T	F	T	F	T	T	T
T	F	F	F	T	F	F
F	T	T	F	F	F	F
F	T	F	F	F	T	T
F	F	T	T	T	T	T
F	F	F	T	T	F	T

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f) $(\neg p \leftrightarrow \neg q) \leftrightarrow (q \leftrightarrow r) = X$

p	q	r	$\neg p$	$\neg q$	$\neg p \leftrightarrow \neg q$	$q \leftrightarrow r$	X
T	T	T	F	F	T	T	T
T	T	F	F	F	T	F	F
T	F	T	F	T	F	F	T
T	F	F	F	T	F	T	F
F	T	T	T	F	F	T	F
F	T	F	T	F	F	F	T
F	F	T	T	T	T	F	F
F	F	F	T	T	T	T	T

Q#1

a) $p \wedge T \equiv p$

p	T	$p \wedge T$
T	T	T
F	T	F

Proved.

b) $p \vee F \equiv p$

p	F	$p \vee F$
T	F	T
F	F	F

Proved

c) $p \wedge F \equiv F$

p	F	$p \wedge F$
T	F	F
F	F	F

Proved

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d) $p \vee T \equiv T$

p	T	$p \vee T$
T	T	T
F	T	T

Proved.

e) $p \vee p \equiv p$.

p	$p \vee p$
T	T
F	F

Proved

f) $p \wedge p \equiv p$

p	$p \wedge p$
T	T
F	F

Proved. =

Q#2

$\neg(\neg p) \equiv p$

p	$\neg p$	$\neg(\neg p)$
T	F	T
F	T	F

Proved.

Q#7

(a)

Jan is not rich or not happy

(b)

Carlos will not bybicycle and not run tomorrow.

(c)

Mei donot walks and deesnot take the bus to class.

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(d)

Ibrahim is not smart or not hardworking.

Q#17

a) $p \vee (p \wedge q) \equiv p$.

p	q	$p \wedge q$	$p \vee (p \wedge q)$
T	T	T	T
T	F	F	T
F	T	F	F
F	F	F	F

Proved

b) $p \wedge (p \vee q) \equiv p$.

p	q	$p \vee q$	$p \wedge (p \vee q)$
T	T	T	T
T	F	T	T
F	T	T	F
F	F	F	F

Proved.

Q#18

$(\neg p \wedge (p \rightarrow q)) \rightarrow \neg q = X$

p	q	$p \rightarrow q$	$\neg p$	$\neg p \wedge (p \rightarrow q)$	$\neg q$	X
T	T	T	F	F	F	T
T	F	F	F	F	T	T
F	T	T	T	T	F	F
F	F	T	T	T	T	T

It is a not Tautology.

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Q#19

$[\neg q \wedge (p \to q)] \to \neg p$. = X .

p	q	$p \to q$	$\neg q$	$\neg q \wedge (p \to q)$	$\neg p$	X
T	T	T	F	F	F	T
T	F	F	T	F	F	T
F	T	T	F	F	T	T
F	F	T	T	T	T	T

It is a tautology.

Q#20

$p \leftrightarrow q$ and $(p \wedge q) \vee (\neg p \wedge \neg q) = X$

p	q	$\neg p$	$\neg q$	$p \leftrightarrow q$	$p \wedge q$	$\neg p \wedge \neg q$	X
T	T	F	F	T	T	F	T
T	F	F	T	F	F	F	F
F	T	T	F	F	F	F	F
F	F	T	T	T	F	T	T

≡

Proved.

Q#21

$\neg(p \leftrightarrow q)$ and $p \leftrightarrow \neg q$

p	q	$p \leftrightarrow q$	$\neg(p \leftrightarrow q)$	$\neg q$	$p \leftrightarrow \neg q$
T	T	T	F	F	F
T	F	F	T	T	T
F	T	F	T	F	F
F	F	T	F	T	T

≡

Proved.

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Q#22

$p \to q$ and $\neg q \to \neg p$

p	q	$p \to q$	$\neg q$	$\neg p$	$\neg q \to \neg p$
T	T	T	F	F	T
T	F	F	T	F	F
F	T	T	F	T	T
F	F	T	T	T	T

$\equiv$

Q#23

$\neg p \leftrightarrow q$ and $p \leftrightarrow \neg q$

p	q	$\neg p$	$\neg p \leftrightarrow q$	$\neg q$	$p \leftrightarrow \neg q$
T	T	F	F	F	F
T	F	F	T	T	T
F	T	T	T	F	T
F	F	T	F	T	F

$\equiv$

Proved

Q#24

$\neg (p \oplus q)$ and $p \leftrightarrow q$

p	q	$p \oplus q$	$\neg(p \oplus q)$	$p \leftrightarrow q$
T	T	F	T	T
T	F	T	F	F
F	T	T	F	F
F	F	F	T	T

$\equiv$

Proved

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Q#25

$\neg(p \leftrightarrow q)$ and $\neg p \leftrightarrow q$

p	q	$p \leftrightarrow q$	$\neg(p \leftrightarrow q)$	$\neg p$	$\neg p \leftrightarrow q$
T	T	T	F	F	F
T	F	F	T	F	T
F	T	F	T	T	T
F	F	T	F	F	F

$\equiv$

Proved

Q#26

$(p \rightarrow q) \wedge (p \rightarrow r)$ and $p \rightarrow (q \wedge r) = x$

p	q	r	$p \rightarrow q$	$p \rightarrow r$	$(p \rightarrow q) \wedge (p \rightarrow r)$	$(q \wedge r)$	x
T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	F
T	F	T	F	T	F	F	F
T	F	F	F	F	F	F	F
F	T	T	T	T	T	T	T
F	T	F	T	T	T	F	F
F	F	T	T	T	T	F	F
F	F	F	T	T	T	F	F

$\equiv$

Proved.

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Q#27

$(p \to r) \wedge (q \to r)$ (X) and $(p \vee q) \to r$ (Y)

p	q	r	p→r	q→r	X	p∨q	Y
T	T	T	T	T	T	T	T
T	T	F	F	F	F	T	F
T	F	T	T	T	T	T	T
T	F	F	F	T	F	T	F
F	T	T	T	T	T	T	T
F	T	F	T	F	F	T	F
F	F	T	T	T	T	F	T
F	F	F	T	T	T	F	T

X ≡ Y

Proved.

Q#28

$(p \to q) \vee (p \to r)$ (X) and $p \to (q \vee r)$ (Y)

p	q	r	p→q	p→r	X	q∨r	Y
T	T	T	T	T	T	T	T
T	T	F	T	F	T	T	T
T	F	T	F	T	T	T	T
T	F	F	F	F	F	F	F
F	T	T	T	T	T	T	T
F	T	F	T	T	T	T	T
F	F	T	T	T	T	T	T
F	F	F	T	T	T	F	F

X ≡ Y

Proved

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Q#29

$(p \to r) \vee (q \to r)$ and $p \to q \to (p \wedge q) \to r$

p	q	r	$p \to r$	$q \to r$	X	$p \wedge q$	Y
T	T	T	T	T	T	T	T
T	T	F	F	F	F	T	F
T	F	T	T	T	T	F	T
T	F	F	F	T	T	F	T
F	T	T	T	T	T	F	T
F	T	F	T	F	T	F	T
F	F	T	T	T	T	F	T
F	F	F	T	T	T	F	T

X ≡ Y

Proved

Q#30

$\neg p \to (q \to r)$ and $q \to (p \vee r)$

p	q	r	$\neg p$	$q \to r$	X	$p \vee r$	Y
T	T	T	F	T	T	T	T
T	T	F	F	F	T	T	T
T	F	T	F	T	T	T	T
T	F	F	F	T	T	T	T
F	T	T	T	T	T	T	T
F	T	F	T	F	F	F	F
F	F	T	T	T	T	T	T
F	F	F	T	T	T	F	T

X ≡ Y

Proved.

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Q#44

$p \Rightarrow T$
$q \Rightarrow T$
$r \Rightarrow F$

$$\frac{p \quad q \quad \neg r}{\therefore T}$$

$(p \wedge q \wedge \neg r)$

Q#45

Exactly two true and false.

p, q, r

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

Q#60

p and q are equivalent
q and r are equivalent
prove p and r equivalent

$$\frac{p \rightarrow q \quad q \rightarrow r}{\therefore p \rightarrow r}$$ Using Hypothetical Syllogism.

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Q#61

p: Directory Base is opened.
q: Monitor is put on closed state.
r: System is in its intial state.

$p \rightarrow (q \rightarrow \neg r)$
$p \rightarrow (\neg q \vee \neg r) \Rightarrow p \rightarrow q \equiv \neg p \vee q$
$\neg p \vee (\neg q \vee \neg r) \Rightarrow p \rightarrow q \equiv \neg p \vee q$
$(\neg p \vee \neg q) \vee \neg r \Rightarrow$ Associative property

Answer

Q#62

p	q	r	$p \vee \neg q$	$\neg p \vee q$	$q \vee r$	$q \vee \neg r$	$\neg q \vee \neg r$
T	T	T	T	T	T	T	F
T	T	F	T	T	T	T	T
T	F	T	T	F	T	F	T
T	F	F	T	F	F	T	T
F	T	T	F	T	T	T	F
F	T	F	F	T	T	T	T
F	F	T	T	T	T	F	T
F	F	F	T	T	F	T	T

We can make 5 truth values simultaneously

Answer

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