NAME : UMAIR KHAN

I.D : 14596

SECTION : A

SEMESTER : 4th BS(SE)

SUBJECT : DISCRETE STRUCTURES

INSTRUCTOR : DAUD KHAN

EXAMINATION : MIDTERM EXAM

Q#6

SOLUTION:

$$(P \wedge q) \wedge r = P \wedge (q \wedge r)$$

P	q	r	$P \wedge q$	$(P \wedge q) \wedge r$	$q \wedge r$	$P \wedge (q \wedge r)$
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	0	0	1	0
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	1	0	0	0
1	1	1	1	1	1	1

Hence proved

$$(P \wedge q) \vee (\sim P \vee (P \wedge \sim q))$$

P	q	$\sim P$	$\sim q$	$P \wedge q$	$P \wedge \sim q$	$(\sim P \vee (P \wedge q))$	$(P \wedge q) \vee (\sim P \vee (P \wedge \sim q))$
0	0	1	1	0	0	1	1
0	1	1	0	0	0	1	1
1	0	0	1	0	1	1	1
1	1	0	0	1	0	0	1

Q 1 b) **SOLUTION:**

p = You get the flu

q = You miss the final examination

r = You pass the course

1) a) $p \rightarrow q$

= If you have flu the you will miss the final examination

2) b) $\neg q \leftrightarrow r$

= You won't miss the final examination if and only if you pass the course.

3) c) $q \rightarrow \neg r$

If you miss the maximation then you will be failing the course.

4) d) $p \vee q \vee r$

You have the flu OR you miss the final examination OR you pass the course.

5) e) $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$

If you have flu you will not

pass the course OR if you miss the final examination then you will fail the course.

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

You have the flu and you miss the final examination OR you will not miss the final examination and you pass the course.

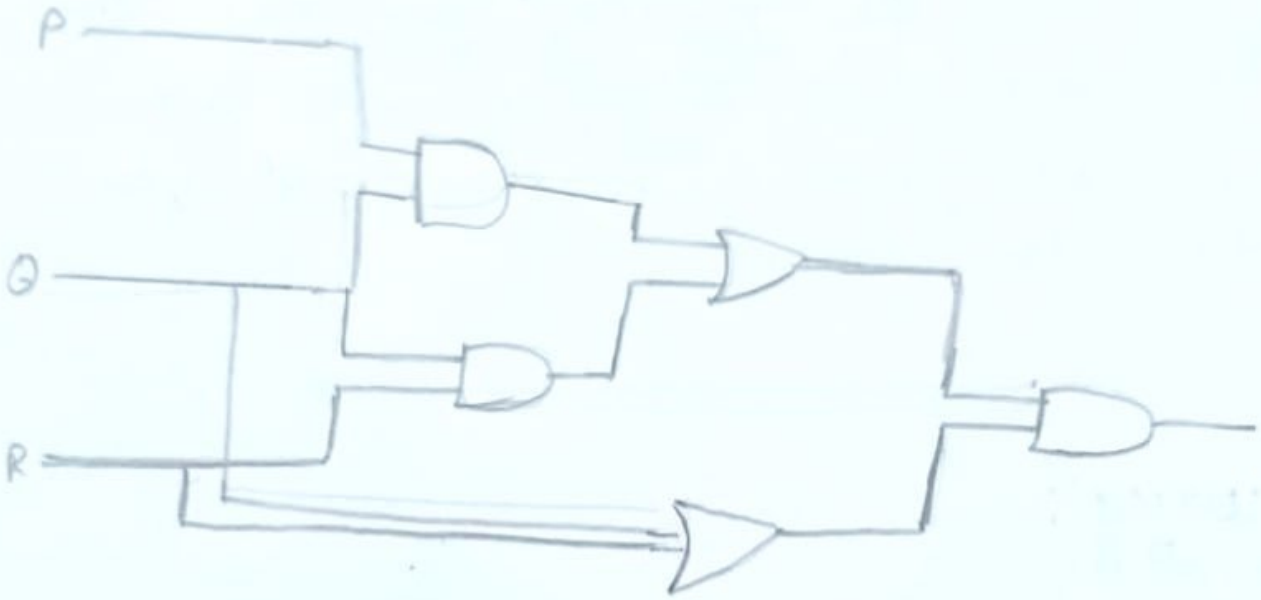
Q 2 a) **SOLUTION:**

$p \rightarrow q \quad q \therefore p$

p	q	~p	p → q	~p ∧ (p → q)
T	T	F	T	F
T	F	F	F	F
F	T	T	T	T
F	F	T	T	T

Q
2)
b) **SOLUTION:**

1) $PQ + QR(Q + R)$



b

Q3)

SOLUTION:

$A = \{a, b, c\}$

$B = \{1, 2, 3, 4\}$

$P(A) = ?$

$P(B) = ?$

$P = 2^n$

$P(A) = 2^3 = 8$

$P(A) = [\{\}, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}]$

$P(B) = 2^4$

$P(B) = 16$

$P(B) = [\{\}, \{1\}, \{2\}, \{3\}, \{4\}, \{1, 2\}, \{1, 3\}, \{1, 4\}, \{1, 2, 3, 4\}, \{1, 2, 3\}, \{1, 2, 4\}, \{2, 3, 4\}, \{1, 3, 4\}, \{2, 3\}, \{2, 4\}, \{4, 3\}]$

$= [\{\}, \{1\}, \{2\}, \{3\}, \{4\}, \{1, 2\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{2, 4\}, \{4, 3\}, \{1, 2, 3\}, \{1, 2, 4\}, \{2, 3, 4\}, \{1, 3, 4\}, \{1, 2, 3, 4\}]$

Q3
b) **THREE FORMS OF SETS:**

The three forms of sets are the following:

i) **EMPTY OR NULL SET:**

DEFINITION:

A set which does not contain any element is called empty set or null set. It is a finite set. It is denoted as {}.

EXAMPLE: The set of whole number less than 0.

ii) **SINGLETON SET:**

DEFINITION:

A set which contain only one element is called singleton set.

EXAMPLE:

$A = \{x : x \text{ is neither prime nor composite}\}$

It is a singleton set containing one element i-e 1.

$B = \{x : x \text{ is a whole number}, x < 1\}$

It is a singleton set containing one element i-e 0.

iii) a) **FINITE SET:**

DEFINITION:

A set which contains a definite number of elements is called a finite set.

EXAMPLE:

- The set of all colors in the rainbow.
- $P = \{2, 3, 7, 13, 17 \ldots\ldots 97\}$

b) **INFINITE SET:**

DEFINITION:

A set containing never-ending elements is called an infinite set.

EXAMPLE:

$A = \{x : x \in N, x > 1\}$

$B = \{x : x \in W, x = 2n\}$