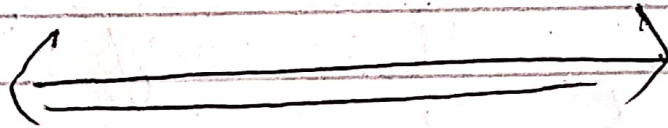


Name - SHAYAN KHA  
ID - 15837  
Paper - Discrete structure  
Department - BS(SE)-2



(1)

Q no 1 A part:

Biconditional statements:

The Biconditional of p and q is "p if, and only if, q"

" $\leftrightarrow$ " is the biconditional operator.

Biconditional statement is true if both p and q have the same truth values and false if p and q have opposite truth values.  
if and only if is abbreviated as iff

Example

" $x > 5$  iff  $x^2 > 25$ "  
false iff

"3 is divisible by 4 if and only if house has four legs"  
false iff

B part:

let p, q, and r represent the following statements.

p: Sam had pizza last night

q: Chris finished her homework.

p + 0



(2)

$\gamma$ : pat watched the news this morning.

Give a formula (using appropriate symbols) for each of these statements.

(1) Sam had pizza last night if and only if Chris finished her homework.

Answer.

$$P \Leftrightarrow Q$$

(2) pat watched the news this morning if and only if Sam did not have pizza last night.

Answer,

$$\gamma \Leftrightarrow \sim P$$

(3) pat watched the news this morning if and only if Chris finished her homework and Sam did not have pizza last night.

Answer:

$$\gamma \Leftrightarrow (Q \wedge \sim P)$$

(4) In order for pat to watch the news this morning it is necessary and sufficient that Sam had pizza last night and Chris finished her homework.

Answer

$$\gamma \Leftrightarrow (P \wedge Q)$$

p.t.o



(3)

Q NO 2:

a) Let's  $p, q, r$  represent the following statements.

$p$ : it is hot today

$q$ : it is sunny

$r$ : it is raining

Express in a words the statements using Biconditional statements represent by the following formula's.

(1)  $q \leftrightarrow p$

Answer,

It is sunny if and only if it is hot today.

(2)  $p \leftrightarrow (q \wedge r)$

Answer,

It is hot today if and only if it is sunny and it is raining

(3)  $p \leftrightarrow (q \vee r)$

Answer

It is hot today if and only if it is sunny or it is raining

(4)  $r \leftrightarrow (p \vee q)$

Ans:

It is raining if and only if it is hot today either it is sunny

P.T.O



NO 3:

Arguments:

Arguments is a list of statements (premises or assumption) followed by a statement conclusion.

- $P_1$  premise
- $P_2$  premise
- $P_n$  premise
- $C$  conclusion

Examples:

An interesting teacher keep me awake.  
I awake in Mathamatic class

Therefore my mathamatic teacher is interesting.

Valid Arguments:

Arguments is valid if the conclusion is true when all the premises are true or if conjunction of it premisis imply conclusion.

$$(P_1 \wedge P_2 \wedge P_3 \dots \wedge P_n) \rightarrow C$$

Invalid Arguments:

Arguments is invalid if the conclusion is p.t.O



(5)

False when all the premisses are true or if conjunction of its premisses does not imply conclusion

$(P_1 \wedge P_2 \wedge P_3 \wedge \dots \wedge P_n) \rightarrow C$  is a contradiction

- Arguments may either valid or invalid; and statement may either true or false

Construct truth table or show up valid and invalid arguments.

Example:

Test the validity of following arguments.

I will buy a new goat or a used gyo.  
if I buy both a new goat and used gyo. I will need a loan.

I both a used gyo and I don't need a loan.

There for I didn't buy a new goat

- A. valid
- B. Invalid

pto



6

Let  
 $P$ : I buy a new foak  
 $q$ : I buy a used yyo  
 $r$ : I need a loan

$$p \vee q$$

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

$$q \wedge \sim r$$

$$\therefore \sim p$$

P	q	r	$\sim r$	$p \wedge q$	$p \vee q$	$(p \wedge q) \rightarrow r$	$q \wedge \sim r$	$\sim p$
T	T	T	F	T	T	T	F	F
T	T	F	T	T	T	F	T	F
T	F	T	F	F	T	T	F	F
T	F	F	T	F	T	T	F	F
F	T	T	F	F	T	T	F	T
F	T	F	T	F	T	T	T	T
F	F	T	F	F	F	T	F	T
F	F	F	T	F	F	T	F	T

There is no row where the conclusion is false while every premises is true (no bad row) so the argument is valid.

a) NO 4:  
UNION:

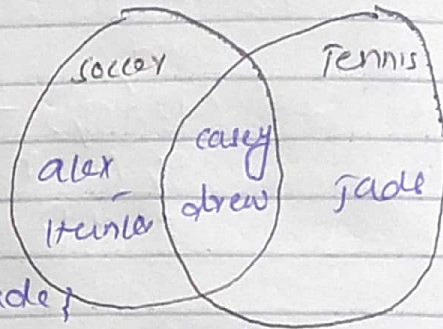
The set made by combining the element of two sets so the union of set A and B is the set of element in A or B Both.

P.T.O



The symbol is a special "u" like this "u".

Example:



Soccer: {alex, hunter, casey, drew, jade}

Tennis = {casey, drew, jade}

Soccer  $\cup$  Tennis = {alex, hunter, casey, drew, jade}

In words:

The union of the "soccer" and "tennis" set is alex, hunter, casey, drew and jade.

Membership table for union:

The truth table for  $A \cup B$

A	B	$A^c$	$B^c$	$A \cup B$
1	1	0	0	1
1	0	0	1	1
0	1	1	0	1
0	0	1	1	0

Intersection: The intersection of two sets A and B



(8)

denoted by  $A \cap B$ . It is the set containing all elements of  $A$  that also belong to  $B$  (or equivalently all elements of  $B$  that also belong to  $A$ ).

$$A \cap B = \{x; x \in A \text{ and } x \in B\}$$

i.e

$x$  is an element of the intersection  $A \cap B$  if and only if  $x$  is both an element of  $A$  and an element of  $B$ .

Example:

- The intersection of the sets  $\{1, 2, 3\}$  and  $\{2, 3, 4\}$  is  $\{2, 3\}$ .
- The number "9" is not in the intersection of the set of Prime number  $\{2, 3, 5, 7, 11, \dots\}$  and the set of odd number  $\{1, 3, 5, 7, 9, 11, \dots\}$  because "9" is not prime.

A	B	$A \cap B$
1	1	1
1	1	1
1	0	0
1	0	0
0	1	0
0	1	0
0	0	0
0	0	0

P.T.O



9

Q NO 5,

(A) Venn Diagram:

A number of computer users are surveyed to find out if they have a printer, modem or scanner. Draw separate Venn diagram and shade the areas which represent the following configurations.

- (i) modem and printer but no scanner
- (ii) scanner but no printer and no modem.
- (iii) scanner or printer but no modem.
- (iv) no modem and no printer.

Example: 13 used both A and B, 28 not use software, 100 students

if twice as many student used B and A write down a pair of simultaneous equation in x and y.

$$3 + 10 + 26 + y = 2(8 + 3 + 10 + x)$$

$$39 + y = 42 + 2x$$

$$\text{or } y = 2x + 3 \quad \text{--- (1)}$$

total number of student = 100

$$8 + 3 + 26 + 10 + 7 + 28 + x + y = 100$$

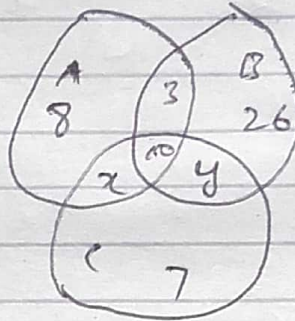
$$82 + x + y = 100$$

P 10



(10)

$$x + y = 18 \quad \text{--- (2)}$$



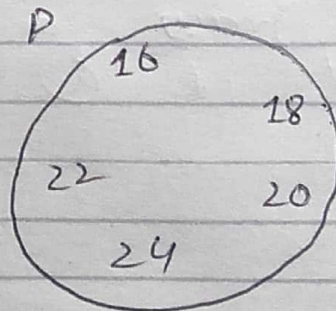
(B) part:

Given the set  $P$  is the set of even number between 15 and 25. Draw and label venn diagram to represent the set  $P$  and indicate all the elements of set  $P$  in venn diagram.

Solution:

$P = \{16, 18, 20, 22, 24\}$  ← between does not include 15 and 25

Draw a circle or oval label it  $P$  put the element in  $P$ .



(C) part:

Draw and label a venn diagram to represent the set.

$R = \{\text{Monday, Tuesday, Wednesday}\}$

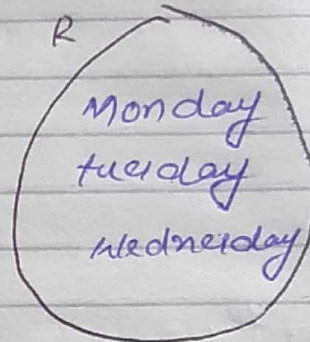
Solution:



(11)

Draw a circle or oval. label it R. put the element in R.

1



D part:

Given the set  $\{x: 2x-3 < 11, x \text{ is a positive integer}\}$  Draw and label a Venn diagram to represent the set.

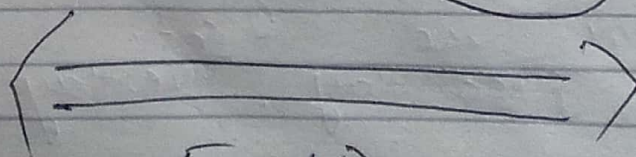
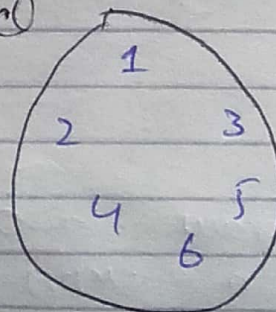
Solution:

Since an equation is given, we need to first solve for  $x$ .

$$2x - 3 < 11 \Rightarrow 2x < 14 \Rightarrow x < 7$$

so  $\{1, 2, 3, 4, 5, 6\}$

Draw a circle or oval. label it R.



END