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ID #:- 14448

Subject:- Discrete structure

Program:- BS(CSE)

Question #1

(A)

Biconditional statement:->

A biconditional statement is a combination of conditional statement and it's converse written in the if and only if form.
Two line segments are congruent if and only if they are of equal length.
A biconditional is true if and only if both the conditionals are true.
Biconditional are represented by the symbol

$\leftrightarrow$ $\longleftrightarrow$ or $\Longleftrightarrow$

(B)

(a) :- sam had pizza last night and chris finished her homework
$(p \wedge q)$

(b) chris and not finish her homework and pat watched the news this morning
$(\sim q \wedge r)$

(c) sam did not have pizza last night or chris did not finish her homework.
$\sim p \vee \sim q$

P.T.O

(i) $p \Longleftrightarrow q$

p	q	$p \Longleftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T

(ii) $\sim r \Longleftrightarrow p$

p	r	$\sim r$	$\sim r \Longleftrightarrow p$
T	T	F	F
T	F	T	T
F	T	F	T
F	F	T	F

(iii) $r \Longleftrightarrow (q \wedge \sim p)$

p	q	r	$\sim p$	$(q \wedge \sim p)$	$r \Longleftrightarrow (q \wedge \sim p)$
T	T	T	F	F	F
T	T	F	F	F	T
T	F	T	F	F	F
T	F	F	F	F	T
F	T	T	T	T	T
F	T	F	T	T	F
F	F	T	T	F	F
F	F	F	T	F	T

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Question 1 (B)

$r \Longleftrightarrow (p \wedge q)$

p	q	r	$p \wedge q$	$r \Longleftrightarrow (p \wedge q)$
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	F	F
F	F	F	F	T

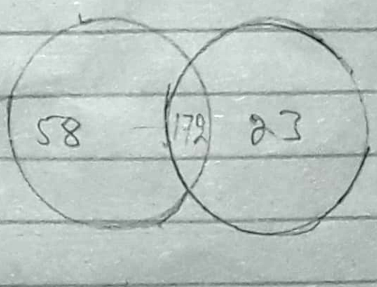
Question 5:-

(A):>

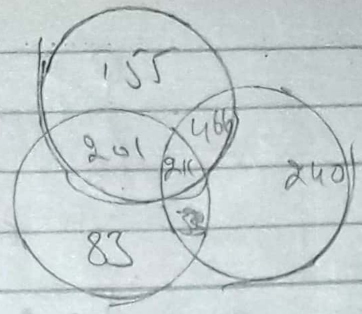
Venn Diagram:>

A venn Diagram is an illustration that uses circles to show the relationship among things or finite groups of things.
Venn Diagram help to visually represent the similarities and differences between two concepts.

Example 1

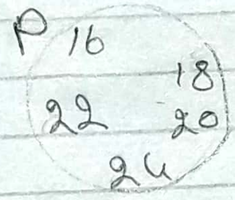


Example 2:-



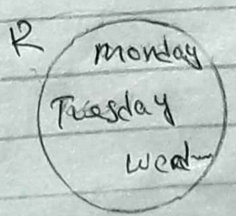
(B)

Let out the elements of P.
$P = \{16, 18, 20, 22, 24\}$ ← 'between' does not include 15 and 25 -
Draw a circle or oval - Label it P.
Put the element in P.



(C):-

Draw a circle or oval. Label it R. Put the elements in R



(D):-

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

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

p.T.O

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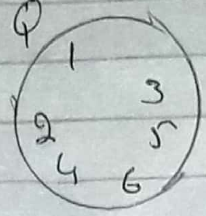

so $Q = [1, 2, 3, 4, 5, 6]$
Draw a circle or oval. Label
it Q
Put the elements in Q.

Question 2:-

* $q \leftrightarrow p$:
It is sunny if and only if it is hot today.

* $p \leftrightarrow (q \wedge r)$:
It is hot today if and only if it is sunny and it is raining.

* $p \leftrightarrow (q \vee r)$
It is hot today if and only if it is sunny or it is raining

* $r \leftrightarrow (p \vee q)$
It is raining if and only if it is hot today or it is sunny.

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Question:3:-

Arguments:-

A logical argument is a claim that a set of premises support a conclusion.

There are two general types of arguments.

(i) Inductive
(ii) Dedective

Example:-

If it is cloudy outside the it will rain.

a conclusion might be "it will rain" intutively, this seems valid.

★ Valid:

An argument is valid if and only if it is necessary that if all of the premises are true, then the conclusion is true. It is impossible that all the premises are true and the conclusion is false.

p	q	r	p → q	q → r	p ∨ q	p ∨ q → r
T	T	T	T	T	T	T
T	T	F	T	F	T	F
T	F	T	F	T	T	T
T	F	F	F	T	T	F
F	T	T	T	T	T	T
F	T	F	T	F	T	F
F	F	T	T	T	F	T
F	F	F	T	T	F	T

We mark the critical rows.

Notice that all critical rows have a true conclusion and thus the argument is valid.

★ Invalid:

An argument that is not valid. We can test for invalidity by assuming that all the premises are true and seeing whether it is still possible for the conclusion to be false. If this is possible, the argument is invalid

P.T.O

Truth table of invalides

$p \vee q$. $p \to \sim q$ $p \to r$ r

p	q	r	$p \vee q$	$p \to \sim q$	$p \to r$	r
T	T	T	T	F	T	T
T	T	F	T	F	F	F
T	F	T	T	T	T	T
T	F	F	T	T	F	F
F	T	T	T	T	T	T
F	T	F	T	T	T	F
F	F	T	F	T	T	T
F	F	F	F	T	T	F

we mark the critical rows,
Notice that the 6th Row is a critical row with a false conclusion, so it follows that the argument is invalid.

Question

No. 4

A **Union:->**

The union of two sets A and B is the set of elements, which are in A or in or in both.
It is denoted by AUB and it is read as 'A union B".

Example #1

A	B	B A U
1	1	1
1	0	1
0	1	1
0	0	0

· Example# 2

C	D	D C U
1	1	1
1	1	1
1	0	1
1	0	1
0	1	1
0	1	1
0	0	0
0	0	0

B Intersection:-

The intersection of two sets A and B denoted by $A \cap B$, is the set containg all elements of A that also belong to B (or equivalently, all elements of B that also belong to A)

Example #1:-

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

Example #2:-

C	D	$C \cap D$
1	1	1
1	1	1
1	0	0
1	0	0
0	1	0
0	1	0
0	0	0
0	0	0