NAME: NAVEED ALI

COURCE NAME: DISCRETE STRUCTURE

UBMITTED TO: SIR ABRAR WAZIR.

DEPARTMENT: BS SOFTWARE ENGINE

EMESTER: 2nd

REG ID: 15958

SECTION: "A"

Question. No: 01)
Ans)

Concept of Biconditional statement:

A biconditional statement is defined to be true whenever both parts have the same truth value. The biconditional operator is denoted by a double-headed arrow. The biconditional p.q represents "p if and only if q". where p is a hypothesis and q is a conclusion.
The following is truth table for biconditional $p \leftrightarrow p$.

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

in the truth table above $p \leftrightarrow q$ is true when p and q have the same truth value (i.e, when either both are true or both are

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false). Now that the bicon-ditional has been defined.

b)

Ans) (i) sam had pizza last night and chris finished her homework $p \land q$.

(ii) Pat watched the news this morning iff sam did not have pizza last night

$$r \Leftrightarrow \neg p$$

(iii) Pat watched the news this morning if and only if chris finished her homework and sam did not have pizz last night.

$$r \Leftrightarrow (q \land \neg p)$$

(iv) In order for Pat to wat the news this morning it is necessary and sufficient that Sam had pizza last night and chris finished her homework.

$$r \Leftrightarrow (p \land q)$$

Question: 02:

a) ① $q \leftrightarrow p$

Ans) If is sunny if and only if if is hot day.

② $p \leftrightarrow (q \wedge r)$

If it is hot day if and only if is sunny and if is raining.

③ $p \leftrightarrow (q \vee r)$

if is hot day if and only if it is sunny either if is raining.

④ $r \leftrightarrow (p I q)$

if is raing if and only if if is hot day either if is sunny.

Question No: 03)
Ans)
Argument:
Argument is a list of statements (premises or assumptions or hypotheses) followed by a statement (conclusion)

P_1 Premise
P_2 Premise
P_n Premise

$\therefore C$ conclusion.

For Example: given the premises:

- "If it is cloudy outside, then it will rain".
- "It is cloudy outside".

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

Differentiate Valid and Invalid agument.
Valid and Invalid Argument:

- Argument is valid if the conclusion is true when all the premises are true or

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if conjunction of its premises imply conclusion $(P_1 \wedge P_2 \wedge P_3 \wedge \ldots \wedge P_n) \rightarrow C$ is a tautology.

- Argument is valid if the conclusion is false when all the premises are true or if conjunction of its premises does not imply conclusion. $(P_1 \wedge P_2 \wedge P_3 \wedge \ldots \wedge P_n) \rightarrow C$ is a contradiction.
- A valid argument may have:
- True premises and a true conclusion.
- Or false premises and a false conclusion.
- Or false premises and a true conclusion.
- But it cannot have all true premises and yet a false conclusion.
- Arguments may either valid or invalid; and statements may either true or false

Or

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; if all the premises are

P-T-O

are True. Then the conclusion must be true: it is imposible That all The premises are true and the conclusion is false.

invalible: argument That is not valid. we can Test for invalidaty by assuming that all The premised are true and seeing whether it is still possible for The conclusion to be false. If This is possible The argument is invalid.

Valid and invalid Examples.

~~Honolulu, HI.~~

#1

Anyone who lives in the city Honolulu HI also lives on the island of oahu. Kanoe does not live on the island of oahu. Therefore, kanoe lives in the city Honolulu, HI.

#2

Anyone who lives in the city Honolulu. HI also lives on the island of oahu. Kanoe does not live on the island of oahu: Therefore ~~can't~~ Kanoe does not live in the city Honolulu HI.

#3

Anyone who lives in The city Honolulu HI also lives on The island of oahu. Kanoe does not live on The island of oahu.

#5
#6
All crows are black
only crows are black.
John is black.
John is black
There fore John is a crow.
There fore John is a crow.

Answers

#2 invalid
#2 valid
#3 invalid
#4 valid
#5 invalid
#6 valid

Truth table showing valid and invalid arguments.

premises.

p→q: If my computer carshes I will loss all my photos.

~q I havent lost all my photos conclusion

~p my computer hasent crashed Argument.

$[p \to q] \wedge \sim q] \to \wedge \sim p]$

pq ~p ~q p→pq [p→q] ∧ ~p]

[p→q] ∧ ~p] → ~p

TT FFTFT

TFF TFFT

FTTFTFT

FFTTTT

Q No: 04)

a)

Ans) Union:

In mathematics, the union (denoted by ∪) of a collection of sets is the set of all elements in the collection. It is one of the fundamental operations through which sets can be combined and related each other.

Union Of Two Sets:

The union of Two sets A and B is the set of element which are in A, in B, or in both A and B. In symbols.

For Example:

If $A = \{1, 3, 5, 7\}$, and $B = \{1, 2, 4, 6, 7\}$ then $A \cup B = \{1, 2, 3, 4, 5, 6, 7\}$. A more elaborate example (involving two infinite sets) is:

$A = \{x$ is an even integer larger than $1\}$

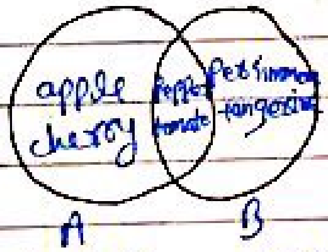
$B = \{x$ is an odd integer larger than $1\}$

P-T-O

As another example, the number 9 is not contained in the union of the sets of prime numbers {2, 3, 5, 7, 11 ...} and the sets of even numbers {2, 4, 6, 8, 10, ...} because 9 is neither prime nor even.

Sets cannot have duplicate elements, so the union of the sets {1, 2, 3} and {2, 3, 4} is {1, 2, 3, 4}. Multiple occurrences of identical elements have no effect on the cardinality of a set or its contents.

Following is the diagram of Union.



Red fruit orange fruit

P and Q is given below.

In the membership table of Union replace, 1 by T and 0 by F then the table is same as of disjunction.

So membership table for Union is similar to the truth table for disjunction (V).

P-T-O

First Example:

A	B	A ∪ B
1	1	1
1	0	1
0	1	1
0	0	0

Truth Table:

P	Q	P ∨ Q
T	T	T
T	F	T
F	T	T
F	F	F

Second Example:

C	D	C ∪ D
1	1	1
1	1	1
1	0	1
1	0	1
0	1	1
0	1	1
0	0	0
0	0	0

Q No : 4)
b)
Ans: Intersection:
In mathematics, the intersection of Two sets A and B, denoted by $A \cap B$, is the set containing all elements of A that also belong to B (or equivalently, all elements of B that also belong to A).

Intersection Of Two Sets Or More Sets:
The intersection of two sets A and B, denoted by $A \cap B$, is the set of all objects that are members of both the sets A and B. In symbols.

That is 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.
For Example:
• The intersection of the sets {1,2,3}, and {2,3,4} is {2,3}.

P—T—O

Q No : 4)

b)

Ans: Intersection:

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Intersection Of Two Sets Or More Sets:

The intersection of two sets A and B, denoted by $A \cap B$, is the set of all objects that are members of both the sets A and B. In symbols.

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For Example:

- The intersection of the sets {1, 2, 3}, and {2, 3, 4} is {2, 3}.

P—T—O

- The number 9 is not in the intersection of the set of prime numbers {2, 3, 5, 7, 11, ...} and the set of odd numbers {1, 3, 5, 7, 9, 11, ...}, because 9 is not prime.

Intersection is an associative operation; that is for any sets A, B, and C, one has
$A \cap (B \cap C) = (A \cap B) \cap C$.
Intersection is also commutative for any A and B, one has $A \cap B = B \cap A$. It thus makes sense to talk about intersections of multiple sets. The intersection of A, B, C, and D, For Example, is unambiguously written $A \cap B \cap C \cap D$.
Inside a universe U one may define the complement A^c of A to be the set of All elements of U not in A. Now the intersection In the membership table of intersection, replace 1 by T and 0 by F then the table is same as of conjunction.

So membership table for intersection is similar to the truth table for conjunction ($\wedge$).

P-T-O

. First Example:

A	B	A ∩ B
1	1	1
1	0	0
0	1	0
0	0	0

Truth Table:

P	Q	P ∧ Q
T	T	T
T	F	F
F	T	F
F	F	F

Second Example:

C	D	C ∩ 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

Q5)
A) VEEN Diagram:-
Ans)
A VENN Diagram is a daigrammatic representation of all the possible relashionship between dyrent set of a finite number of element. venn daigram were concieved around 1880 by John venn. an english logicioan and phelosipher. They are extensively used to Teach Set Theory. A venn daigram is also know is praimary daigram. set daigram or logic daigram.

A veenn daigram is an illustration that uses circles to show the relationship among thing or finit group of things. circles that overlap have a commonelity while circle that do not overlap do not share those Traits.
venn daigrams help to al educianal tolls. since The min-20th cenutry. venn daigram have been used as frist of the introducry

logic curriculum and an elementry level educational plan around The world

<->

Applocation for veenN Daigram:-

VENN Daigram are used To to Defitc item relate to each other againts on overal backdrop. Universal data set on envisoment. A VENN daigram could be used. For example to compare to companies within same industry by the product bouth companies offer (where circle overlap) and the products That are exlusive to each company

Example:

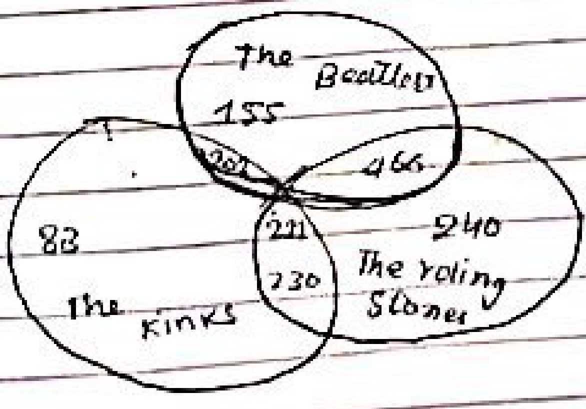
1965 The beatles: way back in The Kinks and The roling Stones to word toured The USA. A large group of teenagers were Surveyed and the following information was obotained. 825 Saw

The kinks 1033 saw the Beatles. 1247 saw the rowling stoness. 211 saw all three 514 saw none 240 saw only the rolling stones. 677 saw the roling stones in the Beatles. and 201 saw the ~~rolling~~ Beatles and the kinks but not the rolling stones.

A:- What percent of the teenagers saw at least one bound.

B:- What percent of the Teenagers saw exactly one bound.

VENN Daigram



Explanation:-

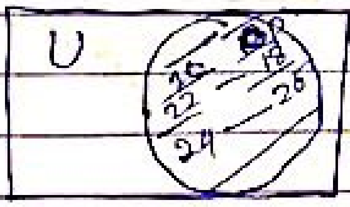
Begin labeling the diagram with the innermost overlap. 211 Saw all three.

• Not also that the region out-side of the circle contines 514. These are Teens who show saw to bands.

b) Given the set p is the set of even numbers b/w 15 and 25 label venn digram.

Solution:-

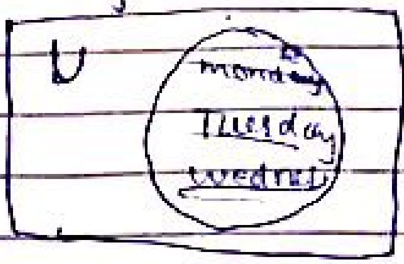
let p = {16, 18, 20, 22, 24}



c) **Solution:**

let R = {monday, Tuesday, wednesday}

venn daigram



Q5) (d) Given The set $Q = \{x : 2x - 3 < 11, x$ is positive integer$\}$ Draw and lebel a venn daigram to represent The set Q.

Solution:

Sol $2x - 3 < 11$

$\Rightarrow 2x < 11 + 3$

$\Rightarrow 2x < 14$

$\Rightarrow \frac{\cancel{2}x}{\cancel{2}} < \frac{\cancel{14}\,7}{\cancel{2}}$

$\Rightarrow \boxed{x < 7}$

So The set is

$Q = \{1, 2, 3, 4, 5, 6\}$

venn daigram