SCHOOL OF COMPUTING

SEMESTER 1, 2020/2021

SECI1013-07 STRUKTUR DISKRIT

(DISCRETE STRUCTURE)

SECTION: 07

ASSIGNMENT 01

GROUP: 02

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DISCRETE STRUCTURE (SECI 1013)

TUTORIAL 1

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1. Let the universal set be the set **R** of all real numbers and let A= $\{x\in\mathbf{R} \mid 0 < x \leq 2\}$, B= $\{x\in\mathbf{R} \mid 1 \leq x < 4\}$ and C= $\{x\in\mathbf{R} \mid 3 \leq x < 9\}$. Find each of the following:

Answer:
A = {1,2}
B = {1,2,3}
C = {3,4,5,6,7,8}

a) $A \cup C$

$\{1,2\}\cup\{3,4,5,6,7,8\}$
$A\cup C = \{1,2,3,4,5,6,7,8\}$

b) $(A \cup B)'$

$(A\cup B) = \{1,2\}\cup\{1,2,3\}$

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

$(A \cup B)' = U - (A\cup B)$
$= \{1,2,3,4,5,6,7,8\} - \{1,2,3\}$

$= \{4,5,6,7,8\}$

c) $A' \cup B'$

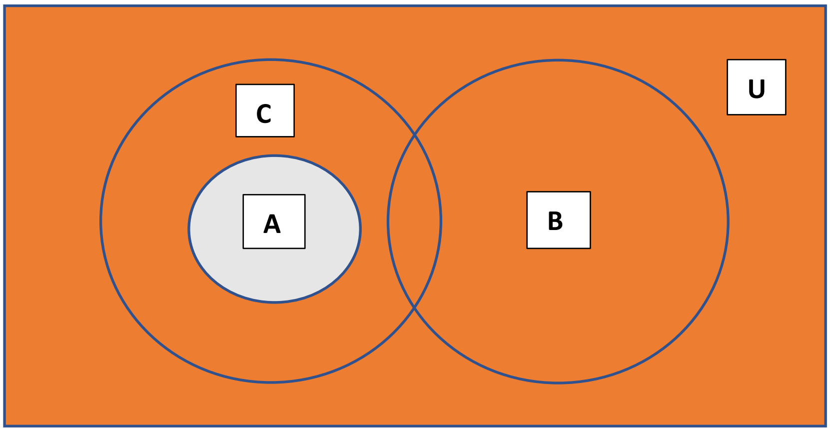
$A' = U-A$
$= \{1,2,3,4,5,6,7,8\} - \{1,2\}$
$= \{3,4,5,6,7,8\}$
$B' = U - B$
$= \{1,2,3,4,5,6,7,8\} - \{1,2,3\}$
$= \{4,5,6,7,8\}$

$A' \cup B' = \{3,4,5,6,7,8\}$

2. Draw Venn diagrams to describe sets A, B, and C that satisfy the given conditions.

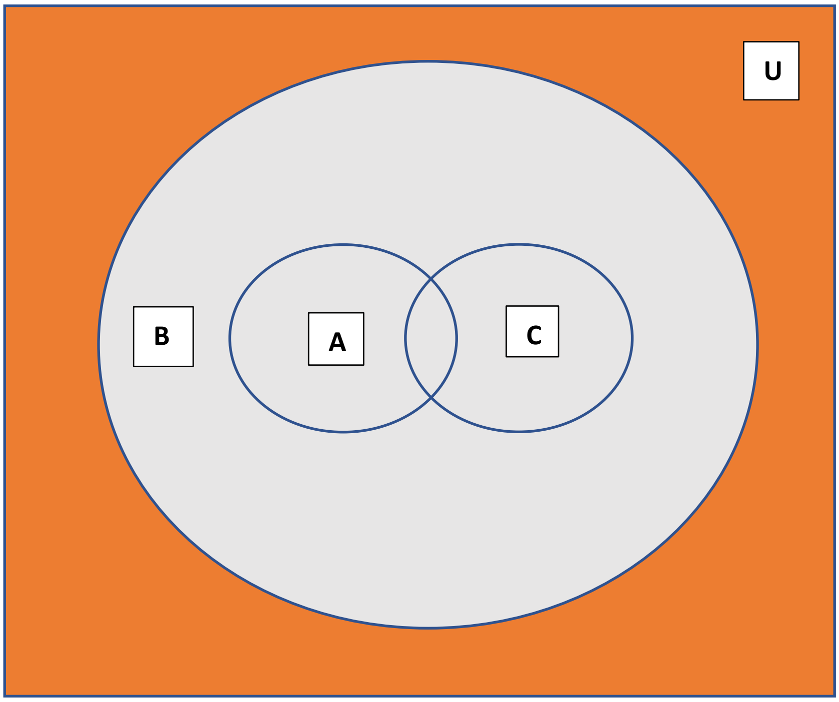
a) $A \cap B = \varnothing,\ A \subseteq C, C \cap B \neq \varnothing$

Answer:



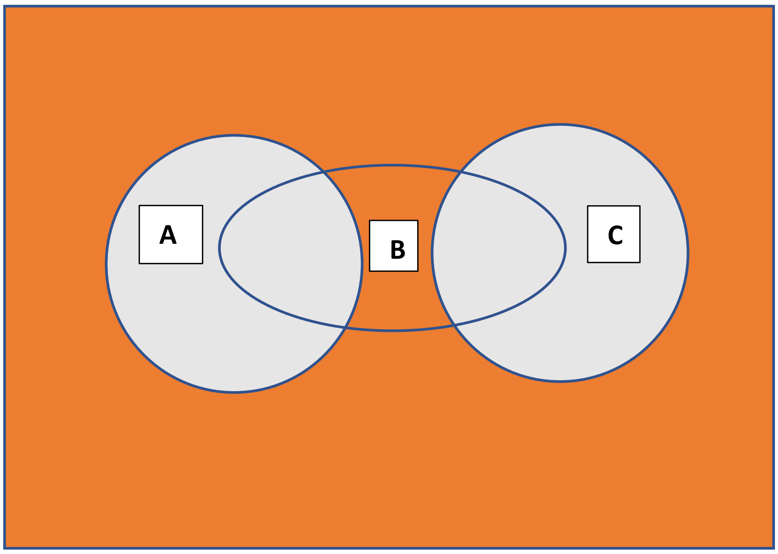
b) $A \subseteq B, C \subseteq B, A \cap C \neq \varnothing$

Answer:



c) $A \cap B \neq \emptyset, B \cap C \neq \emptyset, A \cap C = \emptyset, \; A \not\subset B, C \not\subset B$

Answer:



3. Given two relations S and T from A to B,

$S \cap T = \{(x,y) \in A{\times}B \mid (x,y) \in S \text{ and } (x,y) \in \text{T}\}$

$S \cup T = \{(x,y) \in A{\times}B \mid (x,y) \in S \text{ or } (x,y) \in \text{T}\}$

Let $A = \{-1, 1, 2, 4\}$ and $B = \{1,2\}$ and defined binary relations S and T from A to B as follows:

For all $(x,y) \in A{\times}B$, $\quad x\,S\,y \leftrightarrow |x| = |y|$

For all $(x,y) \in A{\times}B$, $\quad x\,T\,y \leftrightarrow \; x - y$ is even

State explicitly which ordered pairs are in $A{\times}B$, S, T, $S \cap T$, and $S \cup T$.

Answer:

$\boldsymbol{A{\times}B}$ = {(-1,1), (-1,2), (1,1,), (1,2), (2,1), (2,2), (4,1), (4,2)}

S = {(-1,1), (1,1,), (2,2)}

T = {(-1,1), (1,1), (2,2), (4,2)}

$\boldsymbol{S \cap T}$ = {(-1,1), (1,1), (2,2)}

$\boldsymbol{S \cup T}$ = {(-1,1), (1,1), (2,2), (4,2)}

Question 4

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

①	$\neg((\neg p \wedge q) \vee [\neg(p \vee q)]) \vee (p \wedge q)$	De morgan's Laws
②	$[\neg(\neg p \wedge q) \wedge (p \vee q)] \vee (p \wedge q)$	De morgan's Laws
③	$[(p \vee \neg q) \wedge (p \vee q)] \vee (p \wedge q)$	Double Negation Laws
④	$[p \vee (q \wedge -q)] \vee (p \wedge q)$	Distributive laws
⑤	$(p \vee F) \vee (p \wedge q)$	Negation Laws
⑥	$p \vee (p \wedge q)$	Identity Laws
⑦	p	Absorption Laws

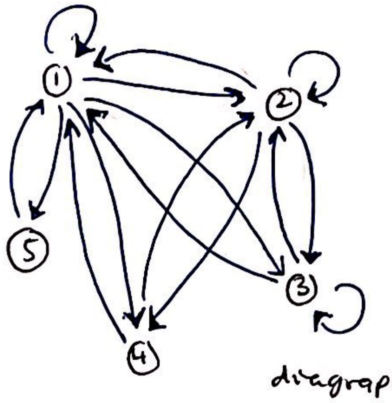
$p \equiv p$

Question 5

a) $R_1 = \{(x,y) \mid x+y \leq 6\}$, $R_1 = \{(1,1),(1,2),(1,3),(1,4),(1,5),$
$(2,1),(2,2),(2,3),(2,4),(3,1)$
$(3,2),(3,3),(4,1),(4,2),$
$(5,1)\}$

A_1 :

$$\begin{array}{c|ccccc} & 1 & 2 & 3 & 4 & 5 \\ \hline 1 & 1 & 1 & 1 & 1 & 1 \\ 2 & 1 & 1 & 1 & 1 & 0 \\ 3 & 1 & 1 & 1 & 0 & 0 \\ 4 & 1 & 1 & 0 & 0 & 0 \\ 5 & 1 & 0 & 0 & 0 & 0 \end{array}$$



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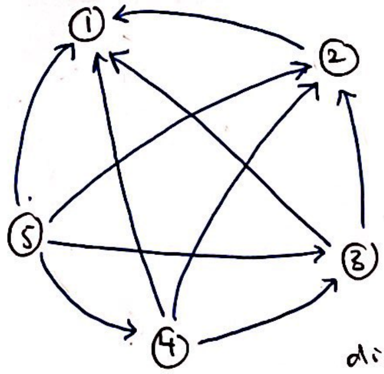
b) $R_2 : \{(y,z) \mid y > z\}$

$R_2 = \{(2,1),(3,1),(3,2),(4,1),(4,2),(4,3),(5,1),(5,2),$
$(5,3),(5,4)\}$

A_2 :

$$\begin{array}{c|ccccc} & 1 & 2 & 3 & 4 & 5 \\ \hline 1 & 0 & 0 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 & 0 & 0 \\ 3 & 1 & 1 & 0 & 0 & 0 \\ 4 & 1 & 1 & 1 & 0 & 0 \\ 5 & 1 & 1 & 1 & 1 & 0 \end{array}$$



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c) R_1 is a symmetric and transitive relation

d) R_2 is a transitive relation

Question 6

matrix R_1 : $\begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline 1 & 1 & 0 & 0 \\ 2 & 0 & 1 & 1 \\ 3 & 1 & 0 & 1 \end{array}$

$R_1 : \{ (1,1), (2,2), (2,3), (3,1), (3,3) \}$

matrix R_2 : $\begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline 1 & 0 & 1 & 0 \\ 2 & 0 & 1 & 0 \\ 3 & 1 & 0 & 1 \end{array}$

$R_2 : \{ (1,2), (2,2), (3,1), (3,3) \}$

a) $R_1 \cup R_2 : \{ (1,1), (1,2), (2,2), (2,3), (3,1), (3,3) \}$

b) $R_2 \cap R_2 : \{ (2,2), (3,1), (3,3) \}$

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Answerr 7

Let, $f(x) = x,$

$g(x) = -x,$

So, $f+g(x) = x-x.$

When, $x=1,$

$f+g(x) = 1-1$

$= 0$

When, $x = 2$

$f+g(x) = 2-2$

$= 0$

Here, $f+g(x)$ has two same co-domain for two diffrent domains.

So, we can say, $f+g$ is not one to one function.

Answer 8

Given that,

$c1 = 1$
$c2 = 2$

So, for $n > 2$ we have combination of more than 2 stairs.

Let's take $c1$ as $= c_{n-1}$
$c2$ as $= C_{n-2}$

So,
Recurrence relation is

$$C_n = C_{n-1} + C_{n-2} \text{ for } n \geq 3$$

Answer 9

Here,

$t0 = 0$, $t1 = 1$, $t2 = 1$

And, $tn = tn-1 + tn-2 + tn-3$ for all $n \geq 3$

ⓐ $t3 = t3-1 + t3-2 + t3-3$

$= t2 + t1 + t0$

$= 1 + 1 + 0$

$= 2$

$t4 = t4-1 + t4-2 + t4-3$

$= t3 + t2 + t1$

$= 2 + 1 + 1$

$= 4$

$t5 = t5-1 + t5-2 + t5-3$

$= t4 + t3 + t2$

$= 4 + 2 + 1$

$= 7$

$t_6 = t6-1 + t6-2 + t6-3$

$= t5 + t4 + t3$

$= 7 + 4 + 2$

$= 13.$

$t_7 = t7-1 + t7-2 + t7-3$

$= t6 + t5 + t4$

$= 13 + 7 + 4$

$= 24$ Answer.

ⓑ Recursive algorithm

```
Input : n
Output : t(n)
t(n)
{
if (n=1 or n=2)
        return 1
else if (n=0)
        return 0
return t(n-1) + t(n-2) + t(n-3)
}
```