DISCRETE STRUCTURE (SECI1013)

TUTORIAL 1

GROUP 4: -

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1. Let the universal set be the set **R** of all real numbers and let A= {x∈**R** | 0 < x ≤ 2}, B= {x∈**R** | 1 ≤ x < 4} and C= {x∈**R** | 3 ≤ x < 9}. Find each of the following:

a) A ∪ C

b) (A ∪ B)′

c) A′ ∪ B′

1. A ∪ C

= {x ∈ R | 0 < x ≤ 2 or 3 ≤ x < 9}

= {x ∈ R | 0 < x < 9}

**A ∪ C = {x ∈ R | 0 < x < 9}**

1. (A ∪ B) ′

(A ∪ B) = {x ∈ R | 0 < x ≤ 2 or 1 ≤ x < 4} = {x ∈ R | 0 < x < 4}

(A ∪ B) ′ = {x ∈ R | ¬ (0 < x < 4)} = {x ∈ R | x ≤ 0 or x ≥ 4}

**(A ∪ B) ′ = {x ∈ R | x ≤ 0 or x ≥ 4}**

1. A′ ∪ B′

A′ = {x ∈ R | ¬ (0 < x ≤ 2)}

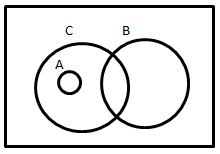
B′ = {x ∈ R | ¬ (1 ≤ x < 4)}

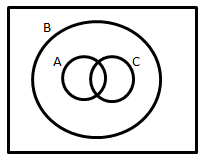
A′ ∪ B′ = {x ∈ R |¬ (0 < x ≤ 2) or ¬ (1 ≤ x < 4)} = {x ∈ R | x < 1 or x > 2}

**A′ ∪ B′ = {x ∈ R | x < 1 or x > 2}**

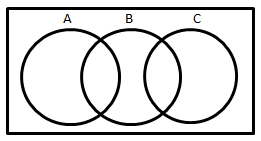
2. Draw Venn diagrams to describe sets *A*, *B*, and *C* that satisfy the given conditions.

a) *A* ∩ *B* = ∅, *A* ⊆ *C*, *C* ∩ *B* ≠ ∅



b) *A* ⊆ *B*, C ⊆ *B*, A ∩ *C* ≠ ∅

c) *A* ∩ *B* ≠ ∅, *B* ∩ *C* ≠ ∅, *A* ∩ *C* = ∅, *A* ⊄ *B,* *C* ⊄ *B*



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

*S* ∩ *T* = {(*x,y*) ∈*A*×*B* | (*x,y*) ∈ *S* and (*x,y*) ∈ T}

*S* ∪ *T* = {(*x,y*) ∈*A*×*B* | (*x,y*) ∈ *S* or (*x,y*) ∈ 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*) ∈*A*×*B*, *x S y* ↔ |*x*| = |*y*|

For all (*x,y*) ∈*A*×*B*, *x T y* ↔ *x− y* is even

State explicitly which ordered pairs are in *A*×*B*, *S*, *T*, *S* ∩ *T*, and *S* ∪ *T*.

*A*= {*−*1, 1, 2, 4}

*B*= {1,2}

**A x 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)}

**S ∩ T** *=* {(-1,1), (1,1), (2,2)}

**S ∪ T =** {(-1,1), (1,1), (2,2), (4,2)}

4. Show that State carefully which of the laws are used at each stage.

From Left Hand side (LHS): -

(LHS)

(De Morgan ‘s laws)

(De Morgan ‘s laws)

(Double negation law)

(Distributive laws)

(Complement law)

(Identity law)

(proven) (Absorption law)

5. is from to ; is from Y to Z ; ordering of X<Y and Z : 1, 2 ,3 ,4 ,5.

a) The matrix of the relation (relative to the given ordering)

b) The matrix of the relation (relative to the given ordering)

1. **i**s reflexive, symmetric, transitive and /or equivalence relation?

- Reflexive: it’s not reflexive since the main diagonal for is not all have value 1.

- Symmetric: its symmetric since

- Transitive: it’s not transitive since: -

- It’s not equivalence relation because it’s not reflexive and not transitive

=

1. is reflexive, Antisymmetric, transitive and /or a partial order relation?

- Reflexive: it’s not reflexive since the main diagonal for is not all have value 1.

- Antisymmetric: it’s not antisymmetric since not belong to

- Transitive: it’s not transitive since: -

- it’s not partial order relation since not reflexive and not transitive

=

6. a) The matrix of relation

. b) The matrix of relation

7. Let and are functions and the function is defined by the formula for all real number x.

Let us assume that and are both one-to-one, then is not one-to-one.

For example:

Let us assume that and for all real number x.

Then f and g are both one-to-one.

Because for all real number and , if then .

And, if , then .

For for all real number x.

Thus, but 1≠2.

is not one-to-one.

8. Given: Climb staircase with 1 stair at a time or 2 stairs at a time or any combination of those two.

Let =number of different wats to climb a staircase with n stairs.

When , the staircase contains only 1 stair thus only climb once, thus there is only one way that is climbing using 1-stair step.

When , the staircase contains only 2 stairs thus only climb twice making it to have two ways to climb the stairs either we climb twice with 1-stair step or climb once with 2-stair step.

When , the staircase contains more than 2 stairs and thus we will need to use a combination of 1-stair and 2-stair steps.

If the last move will be a 1-stair step, then there were ways to arrive at the previous stair which was a staircase with n-1 stairs.

If the last move will be a 2-stair step, then there were ways to arrive at the previous stair which was a staircase with n-2 stairs.

We can conclude that

when n≥3

9. (a)

Given , , .

9. (b) Recursive algorithm to compute .

Tribonacci

if return 0

else if return 1

else if return 1

Else return

#include <iostream>

using namespace std;

int main ()

{

int printTribRec (int n)

{

if (n == 0)

return 0;

if (n == 1 || n == 2)

return 1;

else

return printTribRec (n - 1) + printTribRec (n - 2) + printTribRec(n - 3);

}

void printTrib (int n)

{

for (int i = 1; i < n; i++)

cout << printTribRec(i) << " ";

}

}