SCHOOL OF COMPUTING

SEMESTER I 2020/2021

SECI1013-06 STRUKTUR DISKRIT (DISCRETE STRUCTURE)

ASSIGNMENT 1

GROUP 2

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PENSYARAH: ASSOC. PROF. DR. ROSELINA SALLEHUUDIN

Question 1

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Sec : 06

Answer to the Question NO:1.

given,

Universal set U = all Real numbers = R.

$A = \{x \in R \mid 0 < x \leq 2\}$

$= \{1, 2\}$

$B = \{x \in R \mid 1 \leq x < 4\}$

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

$C = \{x \in R \mid 3 \leq x < 9\}$

$= \{3, 4, 5, 6, 7, 8\}$

Now,

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

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

b) $(A \cup B)' = U - \{1,2\} \cup \{1, 2, 3\}$

$= R - \{1, 2, 3\}$.

c) $A' \cancel{\cup B'} = R - \{1, 2\}$

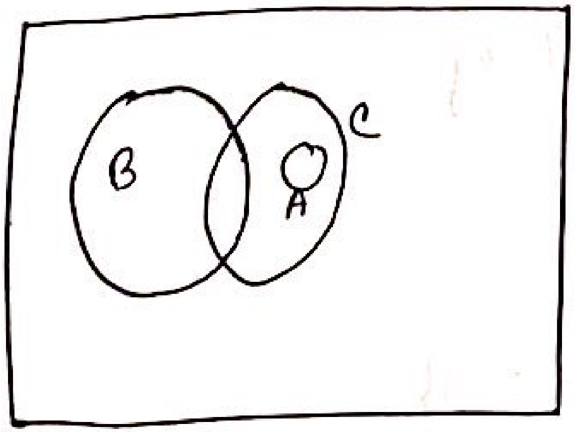
$B' = R - \{1, 2, 3\}$

$A' \cup B' = \{R - \{1, 2\}\} \cup \{R - \{1, 2, 3\}\}$ (Ans)

Answer to the Question NO:2.

Question 2

a) $A \cap B \cancel{\phi} = \phi$, $A \subseteq C$, $C \cap B \neq \phi$



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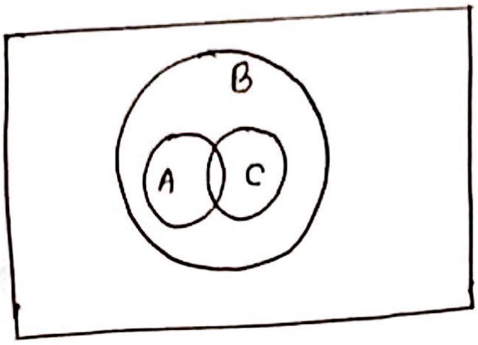
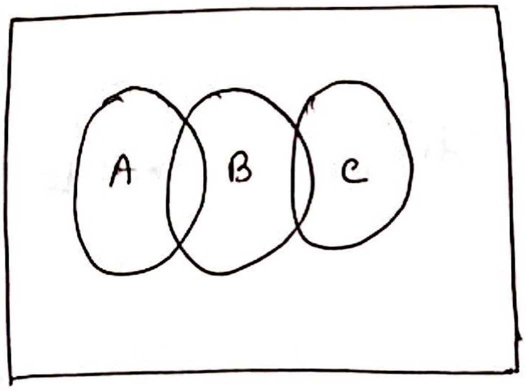
Question 2

Answer to the question NO: 2

b. $A \subseteq B$, $C \subseteq B$, $A \cap C \neq 0$



c. $A \cap B \neq \varphi$, $B \cap C \neq \varphi$, $A \cap C = \varphi$, $A \nsubseteq B$. $C \nsubseteq B$



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3.

Question 3

$A = \{-1, 1, 2, 4\}$

$B = \{1, 2\}$.

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

$S = \{(-1,1), (1,1), (2,2)\}$.

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

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

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

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Question 4

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

$= (\neg(\neg p \wedge q) \vee \neg(\neg p \wedge \neg q)) \vee (p \wedge q)$ [De Morgan's law]

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

$= p \wedge (q \vee \neg q) \vee (p \wedge q)$ [Distributive law].

$= p \vee (p \wedge q)$

$= p$ [Absorption law] [Showed].

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Question 5

5.

$R_1 = \{(1,1), (1,2), (1,3), (1,4), (1,5),$
$(2,1), (2,2), (2,3), (2,4), (3,1),$
$(3,2), (3,3), (4,1), (4,2), (5,1)\}.$

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

a)

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

b)

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

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c) R_1 is not reflexive because $(a,a) \notin R_1$ but $a \in A$.

R_1 is symmetric because for every $(a,b) \in R_1$ there is $(b,a) \in R_1$

$(1,2) \in R$ and $(2,1) \in R$

$(1,3) \in R$ and $(3,1) \in R$

$(1,4) \in R$ and $(4,1) \in R$. and so on.

R_1 is not transitive because for $(a,b) \in R_1 \wedge (b,c) \in R_1 \rightarrow (a,c) \in R_1$

but for, $(4,2) \in R_1 \wedge (2,3) \in R_1 \rightarrow (4,3) \notin R_1$

So it is not equivalence relation.

d) R_2 is reflexive because $(a,a) \in R_2$

R_2 is antisymmetric because for $(a,b) \in R_2$ it has $(b,a) \notin R_2$,

$(2,1) \in R_2$ but $(1,2) \notin R_2$

$(3,1) \in R_2$ but $(1,3) \notin R_2$

$(3,2) \in R_2$ but $(2,3) \notin R_2$

R_2 is not transitive because if for all $(a,b) \in R$ and $(b,c) \in R$ then $(a,c) \in R$ but R_2 has no $a=1$.

So it is not partial order relation.

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6.

Question 6

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

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

$R_1 = \{(1,1), (2,2), (2,3), (3,1), (3,3)\}.$

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

$R_1 \cup R_2 = \{(1,1), (2,2), (2,3), (3,1), (3,3), (1,2)\}.$

$R_1 \cap R_2 = \{(2,2), (3,1), (3,3)\}.$

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(a) $R_1 \cup R_2 = \begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline 1 & 1 & 1 & 0 \\ 2 & 0 & 1 & 1 \\ 3 & 1 & 0 & 1 \end{array}$

(b) $R_1 \cap R_2 = \begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline 1 & 0 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 3 & 1 & 0 & 1 \end{array}$

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Answer to the Question NO: 7.

Question 7

$f(R) = R$,

$g(R) = R$

$(f+g)_{(R)} = R+R$

$= 2R$

let,

$(f+g)(R_1) = (f+g)(R_2)$

$\Rightarrow 2R_1 = 2R_2$

$\Rightarrow R_1 = R_2$.

This showes that, $(f+g)_{(R)}$ is one-to-one

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Question 8

8. n = numbers of stairs
C_n = number of different ways to climb the staircase.

when $n = 1$: only 1 stair can be taken to climb it
$\therefore C_1 = 1$

when $n = 2$: either take 2 stairs at once or take the stairs one by one
$\therefore C_2 = 2$

when $n \geq 3$: we need to use combination of ~~1 s~~ 1 stair and 2 stairs.

if we take 1 step: C_{n-1} more ways to climb the stairs

if we take 2 step: C_{n-2} more ways to climb the stair

$\therefore C_n = C_{n-1} + C_{n-2}$ when $n \geq 3$

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SECTION 6

Question 9

No. ________

Date ________

9. The Tribonacci sequence (t_n) is defined by the equation

$$t_1 = t_2 = t_3 = 1, \quad t_n = t_{n-1} + t_{n-2} + t_{n-3}$$

a) Find t_7

$t_4 = 1 + 1 + 1$	$t_5 = 3 + 1 + 1$	$t_6 = 5 + 3 + 1$	$t_7 = 9 + 5 + 3$
$= 3$	$= 5$	$= 9$	$= 17$

b) Write a recursive algorithm to compute $t_n, n \geq 1$

```
f(n)
{
    if (n=1)
        return 1
    return f(n-1) + f(n-2) + f(n-3)
}
```

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