TFCS TUT-2

1) → A = {0,1,2,3,4} B = {0,1,2,3}

(i) ARB = {(0,0), (1,1), (2,2), (3,3)}

(ii) ARB = {(1,3), (2,2), (3,1), (4,0)}

(iii) ARB = {(0,1) (0,2) (0,3) (1,2) (1,3) (2,3)}

2)

a) R^{-1} = {a,b | b divides a}

b) R' = {a,b | a doesn't divides b}

3) → Set = {1,2,3,4}

a) Not reflexive since (1,1) ∉ R

Not symmetric as (4,3) ∉ R

Not antisymetric since (2,2) ∈ R (2,3) ∈ R but (2,3) ∉ R as 2 ≠ 3

Transitive since (2,3) ∉ R (3,2) ∈ R (2,2) ∈ R

b) Reflexive since all pairs present

Symmetric

Not antisymmetric

Transitive

c) Not Reflexive

Symmetric

Not antisym

Not Transitive (2,4) ∈ R (4,2) ∈ R but (2,2) ∉ R

4) a) Not Irreflexive as (2,2) ∈ R

b) Reflexive as (1,1) (2,2) (3,3) (4,4)

c) Irreflexive since (1,1) ∉ R

5) $(x, y) \in R$

→ $x + y = 0$ Symmetric, Not anti, Not transitive.

$\{(0,0)\ (1,-1)\ (\frac{1}{2}, \frac{-1}{2})\ (2,-2)\}$

→ Not Equivalence since it is not reflexive, Transitive & anti symmetric

→ Not Partial order since it is not reflexive.

b) $x = \pm y$ → Reflexive.

→ Symmetric

$x = -x$

$(-x, x)$ $(x, -x)$ But $x \neq -x$

so not antisymmetric.

$x = \pm y$ so Transitive.

$y = \pm z$ → Equivalence

so $x = \pm z$ → Not Partial order

c) $x - y$

$x - x = 0$ Reflexive.

$(x, y) \Rightarrow (x - y) = p/q$] Rational.

$(y, x) \Rightarrow (y - x) = -p/q$

hence Symmetric.

→ Not antisymmetric as $x \neq y$

$x - y = \frac{p}{q}$ $y - z = \frac{r}{s}$

$x - z = \frac{p}{q} + \frac{r}{s}$ hence rational

So transitive. → Equivalence

→ Not Partial.

d) $x = 2y \Rightarrow$ Not Reflexid.

Not symmetric

$x = 2y \quad (x,y) \in R$

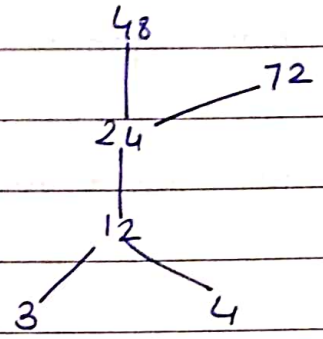
their is not (y,x) so anti symetric.

$x = 2y$

$y = 2z$ so $x = 4z$ so not transitid.

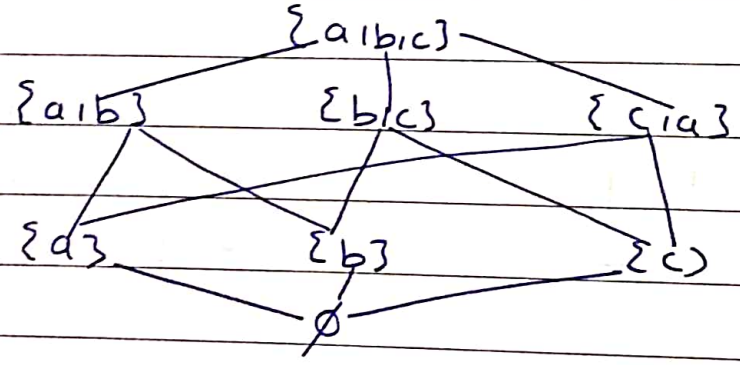
Not Partial order.

7) (3,12) (3,24) (3,48) (3,72) (4,12) (4,24)
(4,48) (4,72) (12,24) (12,48) (12,72)
(24,48) (24,72)

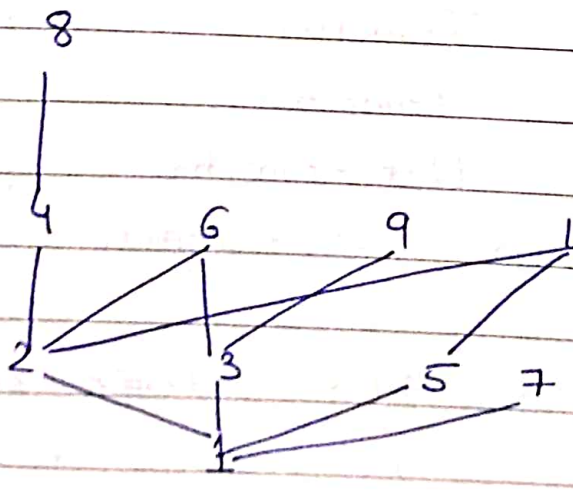


8) $A = \{a, b, c\}$

$P(A) = \{\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{a,c\}, \{a,b,c\}\}$



9)



Least element = 1

greatest does not exist.

10) $\{1, 2, 3\}$.

a)
$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \end{array}$$

b)
$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

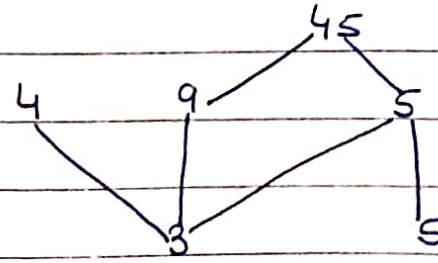
c)
$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} \end{array}$$

d)
$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix} \end{array}$$

11)
a) Reflexive Symmetric Transitive.
b) Not Reflexive Symmetric Transitive.
c) Reflexive Symmetric Transitive.
d) Reflexive Symmetric Not transitive
e) Reflexive Not symmetric Not transitive.

12)
(a,a) (a,b) (a,c)
(b,a) (b,b) (b,c)
(c,a) (c,b)
(d,a)

6) $\{\{3,5,9,15,24,45\},\{3\}$
(3,9) (3,15) (3,24) (3,45)
(5,15) (5,45) (9,45) (15,45)

4)


a) No
b) No
c) No
d) Yes.