SIGaNaY, EUNICE D

BSCpE 3-2L

ACT 9

RELATIONS

1.

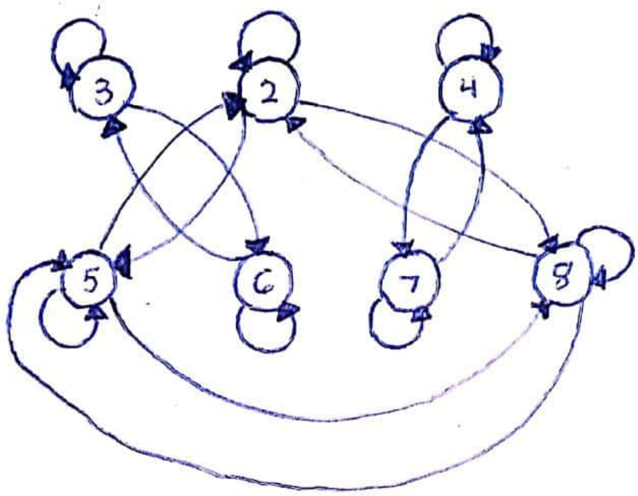
G: $A = \{2, 3, 4, 5, 6, 7, 8\}$

R be a relation over A

xRy iff $x - y = 3n$ for some $n \in \mathbb{Z}$.

$R = \{(2,2), (3,3), (4,4), (5,5), (6,6), (7,7), (8,8)$
$(8,5), (5,8), (8,2), (2,8), (7,4), (4,7), (6,3)$
$(3,6), (5,2), (2,5)\}$

Graph:



Binary Matrix

A	2	3	4	5	6	7	8
2	1	0	0	1	0	0	1
3	0	1	0	0	1	0	0
4	0	0	1	0	0	1	0
5	1	0	0	1	0	0	1
6	0	1	0	0	1	0	1
7	0	0	1	0	0	1	0
8	1	0	0	1	1	0	1

as $(2,2) \in R \rightarrow 1$

$(2,3) \notin R \rightarrow 0$

2. Given Binary Matrix Relations Q, R, S :

EVALUATE: Suppose $A = \{a, b, c\}$, $B = \{a, b\}$, $C = \{a, b, c, d\}$

A. $M_{R \circ Q}$

B. $M_{S \circ Q}$

C. $M_{S \circ R^{-1}}$

$$Q = \begin{array}{c} \\ a \\ b \\ c \end{array} \begin{array}{c} \begin{array}{cc} a & b \end{array} \\ \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix} \end{array} \quad R = \begin{array}{c} \\ a \\ b \end{array} \begin{array}{c} \begin{array}{cccc} a & b & c & d \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix} \end{array} \quad S = \begin{array}{c} \\ a \\ b \end{array} \begin{array}{c} \begin{array}{cc} a & b \end{array} \\ \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \end{array}$$

A: $R = \{(a,a), (a,d), (b,b), (b,d)\}$

$Q = \{(a,a), (b,b), (c,a), (c,b)\}$

$R \circ Q = \{(a,a), (b,b), (b,d), (c,d)\}$

$$M_{R \circ Q} = \begin{array}{c} \\ a \\ b \\ c \end{array} \begin{array}{c} \begin{array}{cccc} a & b & c & d \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \end{array} \quad //$$

B. $S = \{(a,b), (b,a)\}$

$Q = \{(a,a), (b,b), (c,a), (c,b)\}$

$S \circ Q = \{(a,b), (b,a), (c,b), (c,a)\}$

$$M_{S \circ Q} = \begin{array}{c} \\ a \\ b \\ c \end{array} \begin{array}{c} \begin{array}{cc} a & b \end{array} \\ \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix} \end{array} \quad //$$

C: $S = \{(a,b), (b,a)\}$

$R = \{(a,a), (a,d), (b,b), (b,d)\}$

$R^{-1} = \{(a,a), (d,a), (b,b), (d,b)\}$

$S \circ R^{-1} = \{(a,b), (d,b), (b,a), (d,a)\}$

$$M_{S \circ R^{-1}} = \begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{array}{c} \begin{array}{cc} a & b \end{array} \\ \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 0 \\ 1 & 1 \end{bmatrix} \end{array} \quad //$$

3. G: $A = \{1, 2, 3, 4, 5\}$

$R = \{(a, b) \in A \times A\}$

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

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

A. $S \circ R = \{(2,1) (2,3), (3,1), (3,2), (3,4), (3,5), (4,1)$
$(4,5)\}$

Domain $= \{2, 3, 4\}$

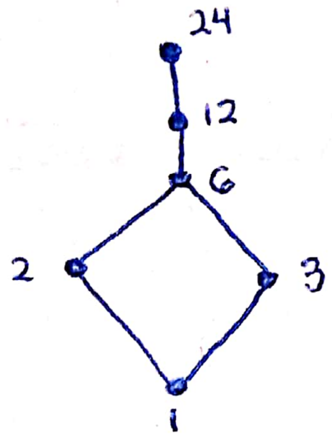
Range $= \{1, 2, 3, 4, 5\}$

B. $(S \circ R)^{-1} = \{(1,2), (3,2), (1,3), (2,3), (4,3)$
$(5,3), (1,4), (5,4)\}$

$\overline{S \circ R} = \{(1,1), (1,2) (1,3), (1,4), (1,5), (2,2),$
$(2,4), (2,5), (3,3), (4,2), (4,3), (4,4)$
$(5,1), (5,2), (5,3), (5,4), (5,5)\}$

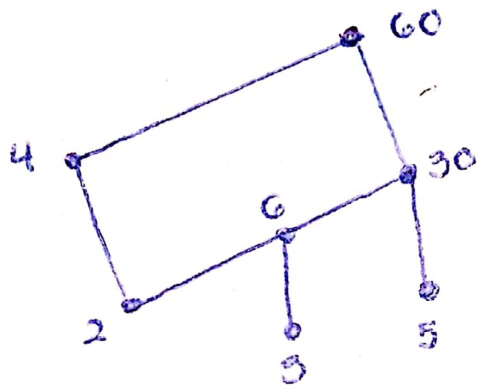
4. HASSE DIAGRAM

A. $(\{1, 2, 3, 6, 12, 24\}, |)$



24 divisible by
1, 2, 3, 6, 12 and 24

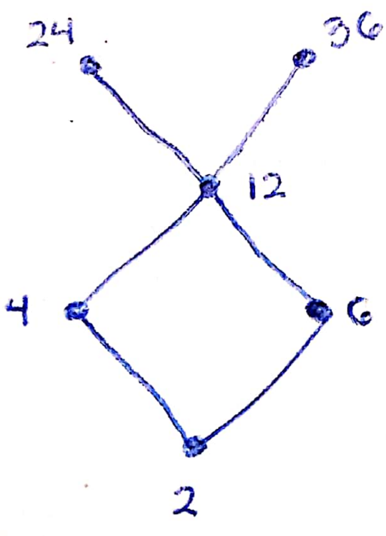
B. $(\{2, 3, 4, 5, 6, 30, 60\}, |)$



30 is not divisible by 4
so they are not connecte

Same with, 2, 3 and 5

C. $(\{2, 4, 6, 12, 24, 36\}, |)$

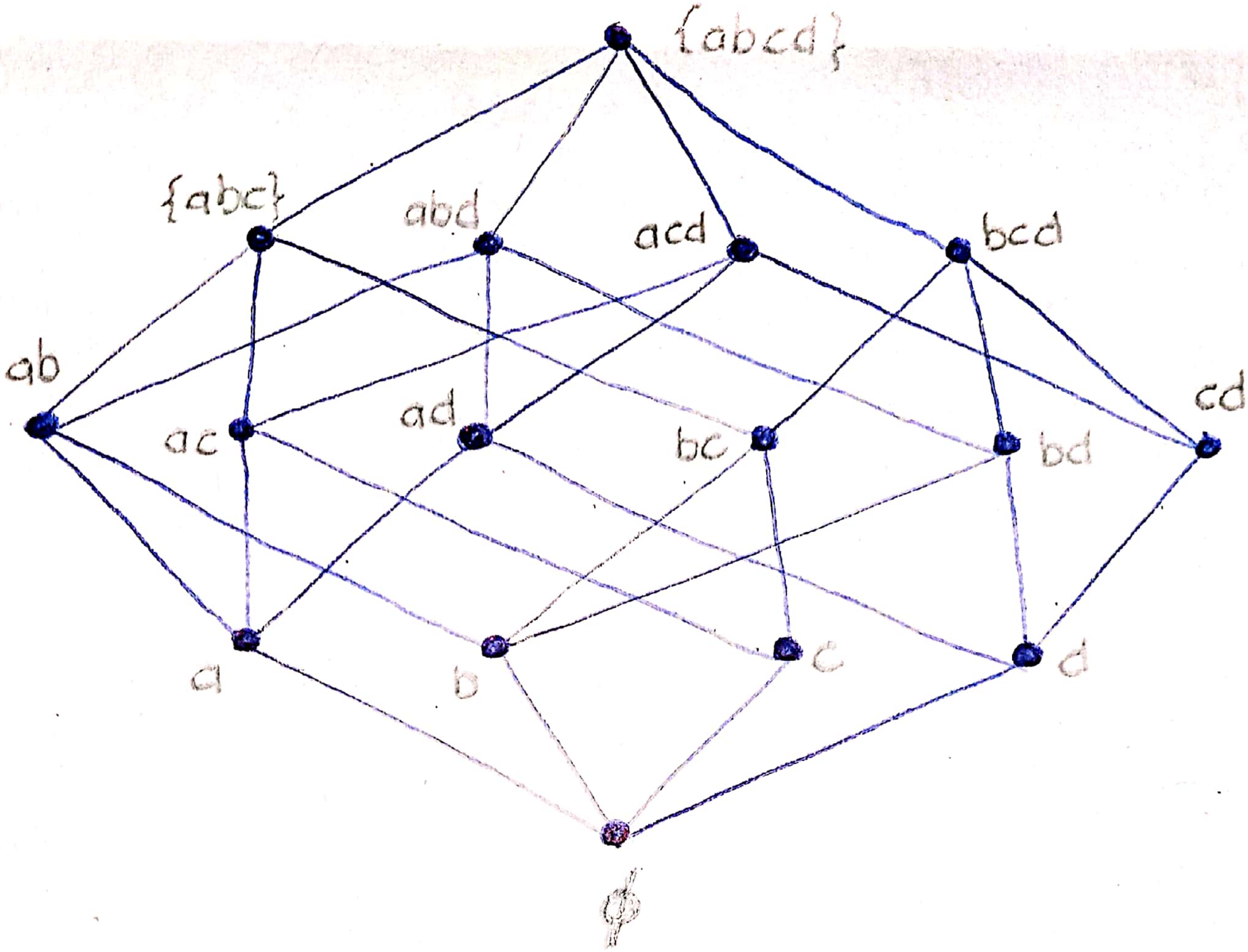


not connected

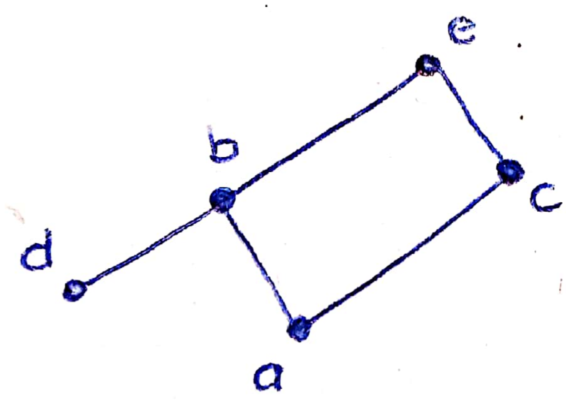
24 and 36
are divisible by
12, 6, 4, 2

D. $(P(\{a,b,c,d\}), \subseteq)$

$P(A) = \{\emptyset\}, \{a\}, \{b\}, \{c\}, \{d\}, \{ab\}, \{ac\}, \{ad\}$
$\{bc\}, \{bd\}, \{cd\}, \{abc\}, \{acd\}, \{bcd\}, \{abd\}$
$\{abcd\}$

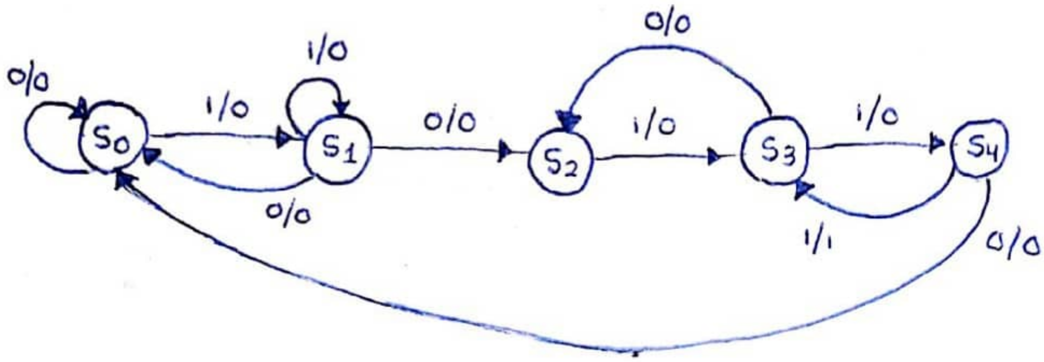


E. $R = \{(a,a)(a,c)(a,b)(a,e)(d,d).(d,b)(d,e)$
$(c,c)(c,e)(b,b)(b,e)(e,e)\}$

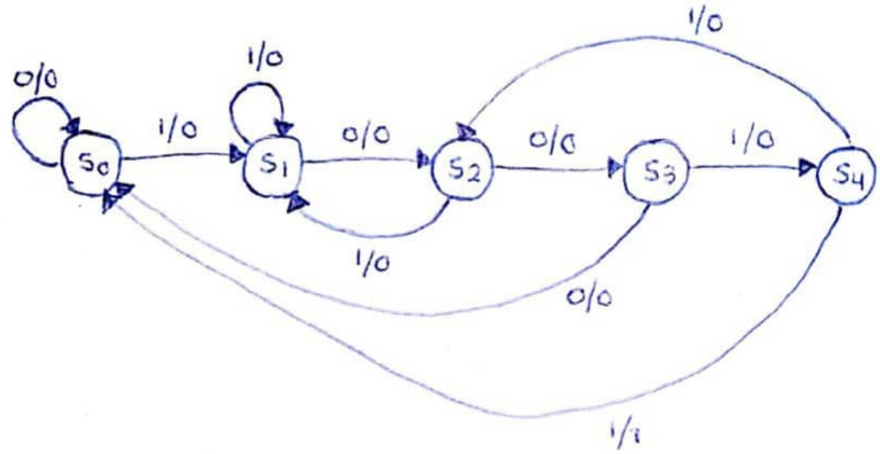


5. STATE DIAGRAM - OVERLAPPING

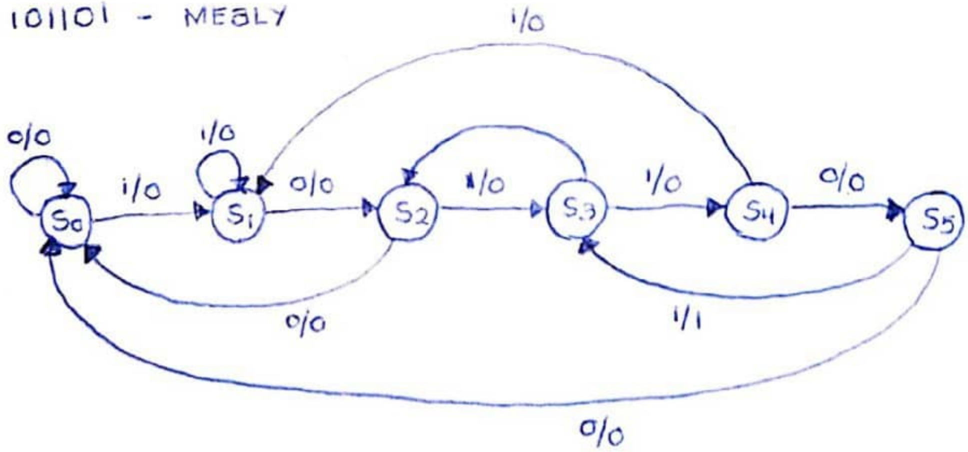
A. 10110 - MEALY



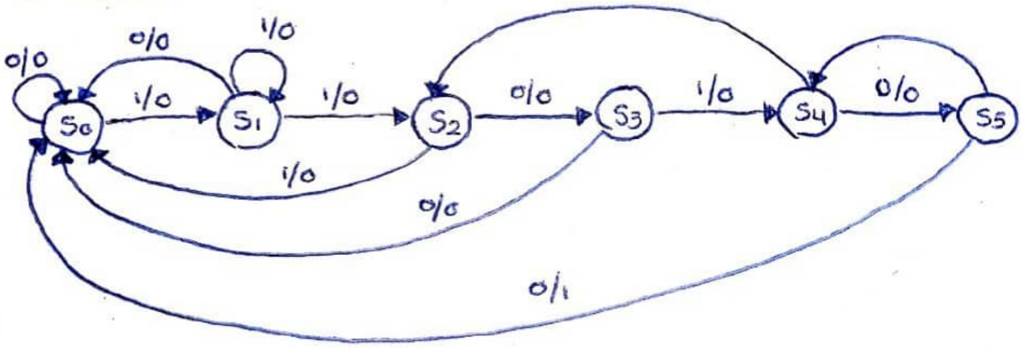
B. 10011 - MOORE



C. 101101 - MEALY



D. 110100 - MOORE



6. STATE TABLE

A. MOORE STATE MACHINE

Current State	Next State 0	Next State 1	Output
S(0)	S(0)	S(1)	0
S(1)	S(0)	S(2)	0
S(2)	S(0)	S(3)	0
S(3)	S(0)	S(3)	1

B. MEALY STATE MACHINE

Current State	Next State 0		Next State 1	
	state	o/p	state	o/p
S(0)	S(0)	0	S(1)	0
S(1)	S(2)	0	S(1)	0
S(2)	S(0)	0	S(3)	0
S(3)	S(0)	1	S(1)	0