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Kelas: B

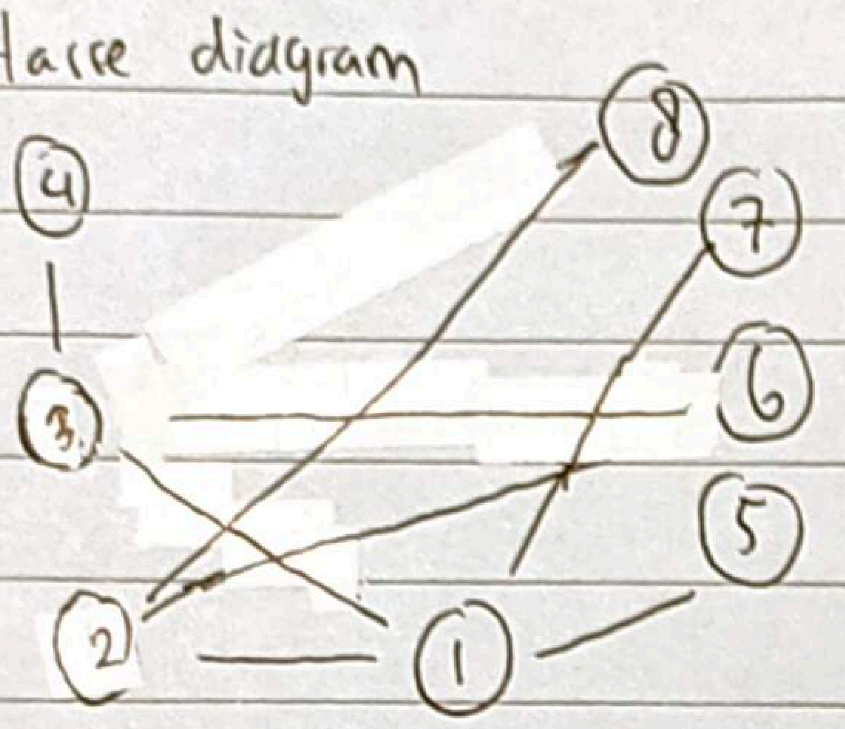
UAK MATEMATIKA DISKRIT 2021/2022

Tipe A

$R = \{(a,b) \mid a \text{ devides } b\}$

$\boxed{A1}$ a) $R = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6)$
$(1,7), (1,8), (2,2), (2,4), (2,6),$
$(2,8), (3,3), (3,6), (4,4), (4,8),$
$(5,5), (6,6), (7,7), (8,8)\}$

b) Hasse diagram



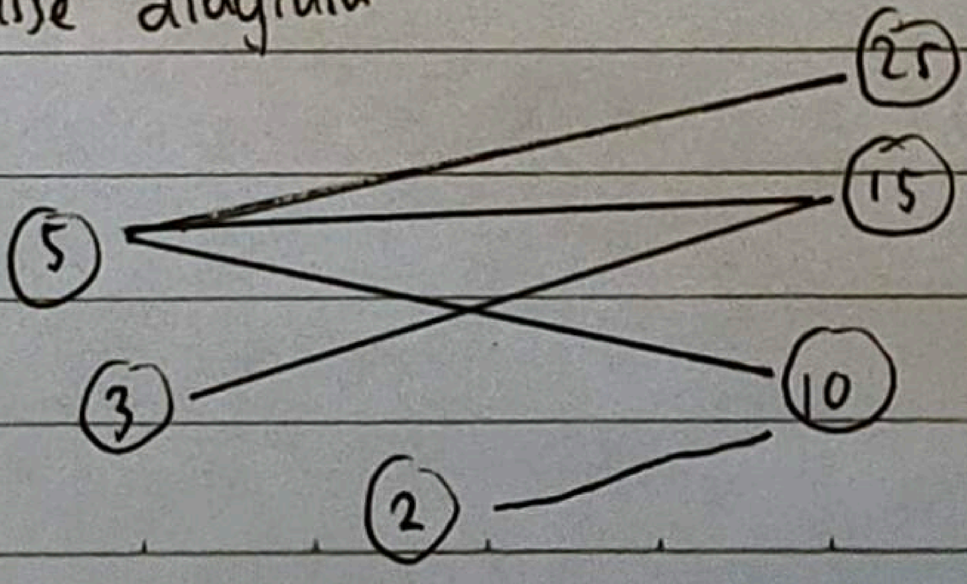
c) An equivalence relation sets need to be reflective, symetry, and transitif

∴ This sets is reflective because $(\forall x \in A)\ xRx$. In other words, every x element in the sets have loop.

∴ This sets is not symetrical, because $(\forall x,y \in A)\ xRy \rightarrow yRx$. For proof, there is $(1,2)$ but there is no $(2,1)$. Thus the sets is not symetry and the sets is not equivalence relations.

$\boxed{A2}$ a) $R = \{(2,2), (2,10), (3,3), (3,15), (5,5)$
$(5,10), (5,15), (5,25), (10,10), (11,11)$
$(15,15), (25,25)\}$

b) Hasse diagram



c) Determine if these sets is equivalence relation!

∴ This sets is reflective because $(\forall x \in A)\ xRx$. In other words, every x element in the sets have loop.

∴ This sets is not symetrical because $(\forall x,y \in A)\ xRy \rightarrow yRx$. For proof, there is $(5,10)$ but there is no $(10,5)$. Thus the sets is not symetry and the sets is not equivalence relation.

Tipe B

$\boxed{B1}$ Proof that Least Common Multiple of j,k is $\frac{jk}{i} \rightarrow \text{lcm}(j,k) = \frac{jk}{i}$

∴ We know that if ab is an integer, then:

$$ab = \gcd(a,b) \cdot \text{lcm}(a,b)$$

Now, we know that $\gcd(j,k) = i$
while

$$jk = \gcd(j,k) \cdot \text{lcm}(j,k).$$

These proof that

$$\text{lcm}(j,k) = \frac{jk}{\gcd(j,k)} = \frac{jk}{i}$$

Thus, $\text{lcm}(j,k) = \frac{jk}{i}$ is true ▨

$\boxed{B2}$ Proof that $r^{q-1} \equiv 1 \pmod q$

$\gcd(q,r) = 1$

$ir \equiv jr \pmod q \quad 1 \leq i, j \leq (q-1)$

Thus the proof of $r^{q-1} \equiv 1 \pmod q$ is true ▨

Tipe C

ID Number : 21/481767/TK/53170

xy xi xi

C0 Set A = (8-7) mod 3 +1

Set B = (0+1+3) mod 4 +1

•) Set A = 1 mod 3 +1 = 2

Set B = 4 mod 4 +1 = 1

C1 Recursive algorithm to compute $\sum_{i=0}^{n} \frac{A}{B^i}!$

$$\sum_{i=0}^{n} \frac{A}{B^i}!$$

Initial value : $f(0) = \frac{2}{1^0}! = 2! = 2$

$f(1) = \frac{2}{1^1}! = \frac{2}{1}! = 2$

The recursive algorithm is

$f(i+1) = f(i) \cdot 1$

Because all iteration i will resulting to devide A with 1, than the recursive algorithm should be true.

C2 We are going to prove inductively,

if $i \in \mathbb{Z}$, than $K \cap k+1 \in \mathbb{Z}$.

Set proposition: $P(n) = f(n+1) = f(n).1$

∴ Basis step · $P(0) : f(0+1) = f(0).1$

when $f(0) = 2$ then $f(0+1) = 2$

∴ Inductive Steps: $P(k) \longrightarrow P(k+1)$

∴ Inductive Hipotesis :

$P(k) : f(k+1) = f(k)$

∴ Show : $P(k+1) : f(k+2) = f(k+1)$

$f(k+2) = f(k+1) = f(k)$

For $P(k+2)$, the propossition is always true

Thus $P(n)$ is true ∎

C3 How many ways to place A student from diffent departement tutor assistant in A+B-1 paralel classes at DTETI

A = 2 = n

A+B-1 = 2

The way to put it is using DOUB!

∴ $\sum_{j=1}^{k} S(n,j)$ while

∴ $S(n,j) = \frac{1}{j!} \sum_{i=0}^{j-1} (-1)^i \binom{j}{i} (j-i)^n$

$S(2,1) = \frac{1}{1!} \sum_{i=0}^{0} (-1)^0 \binom{1}{0} (1-0)^2$

$= 1$

$S(2,2) = \frac{1}{2!} \sum_{i=0}^{1} (-1)^i \binom{2}{i} (2-i)^2$

$= 2 + (-1) = 2$

$\sum_{j=1}^{k} S(n,j) = 1 + 2 = 3$ ways.

C4 Construct language : $G = (V, T, S, P)$

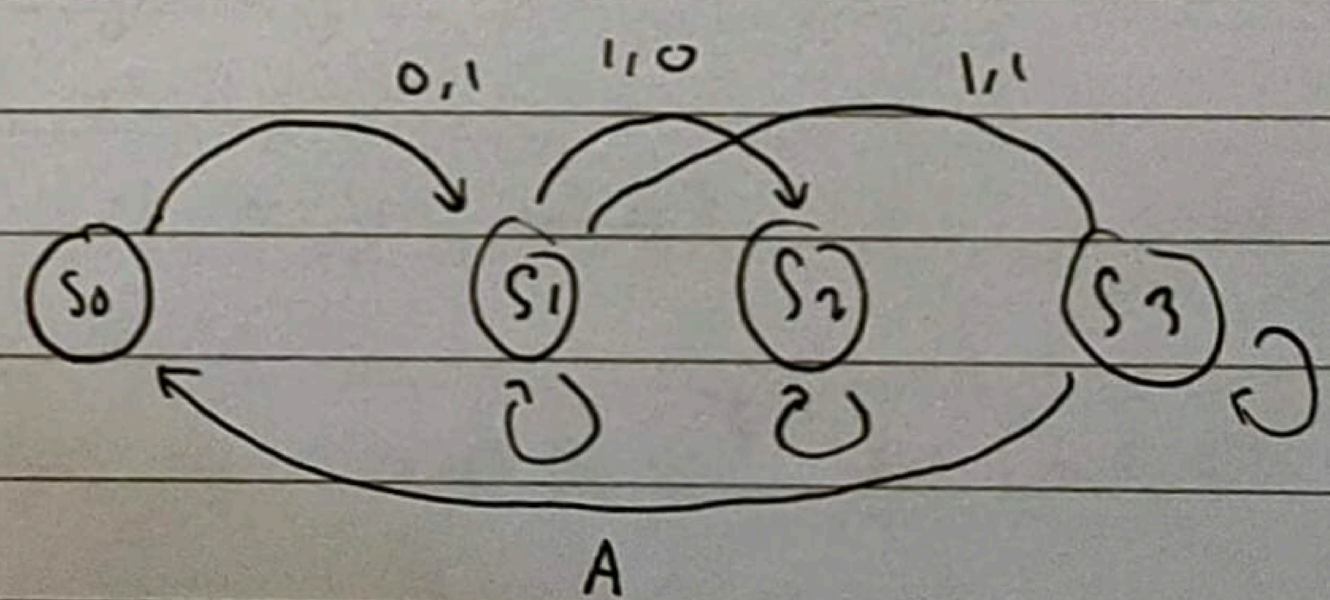
$V = \{ A \leq x < 10 \cup B \leq x < 10 \}$

$T = \{ A, x, B \}$, A = 2 dan B = 2

$P = \{ S \to AB, S \to Ax, x \to AB, x \to Ax, x \to xB, x \to Bx \}$

C5 I = {marjo, durian, apple, duku}

FSM



Tipe D

$\boxed{1}$ Find route with shortest time from Boston to Los Angeles!

Indeks	L	V−L	−	D_C	D_N	D_{Da}	D_{De}	D_S	D_L
−	Æ	{semua}		3	2	∞	∞	∞	∞
N	{N}	{semua −N}		3		8	∞	∞	∞
C	{N, C}	{semua −N, −C}				8	9	8	10
Da	{N, C, Da}	{semua −N, −C, −Da}					9	8	10
Ds	{S, N, C, Da}	{semua −N, −C, Da}					9		10
De	{S, N, C, Da, De}	{L}							10

The shortest rout has total time of 10 second

$\boxed{2}$ Minimum Spanding Tree

B → NY → P, → A → NO → MF,
CH → CI → P, A → MI

3 + 5 + 7 + 6 + 4 + 6 + 7 + 6
= 44