3-AMALIY MASHGULOT. Munosabatlarning turlarini aniqlash. Refleksivlik. Simmetriklik. Tranzitivlik. Antisimmetriklik. Ekvivalent munosabatlarni aniklashga doir misollar yechish

Reja:

1. Munosabatlarning turlari bo'yicha tushunshalar
2. Mustaqil bajarish uchun masala va topshiriqlar
   2.1. Munosabatlarning turlarini aniqlashga doir topshiriqlar
   2.2. Ekvivalent munosabatlarni aniklashga doir topshiriqlar

1. Munosabatlarning turlari bo'yicha tushunshalar

Binar munosabatlarda $(x;y)\in P$ o`rniga $x\,P\,y$ yozuv ham ishlatiladi.

3.1-Ta'rif 1. Agar X to'plamdagi ixtiyoriy x element to'g'risida u o'z-o'zi bilan P munosabatda deyish mumkin bo'lsa, X to'plamdagi munosabat **refleksiv munosabat** deyiladi va xPx ko'rinishida belgilanadi.

3.2-Ta'rif. Agar X to'plamdagi x elementning y element bilan P munosabatda bo'lishidan y elementning ham x element bilan P munosabatda bo'lishi kelib chiqsa, X to'plamdagi P munosabat **simmetrik munosabat** deyiladi va $x\,P\,y \quad\Rightarrow\quad y\,P\,x$ ko'rinishida belgilanadi.

3.3-Ta'rif . Agar X to'plamdagi x elementning y element bilan P munosabatda bo'lishi va y elementning z element bilan P munosabatda bo'lishidan x elementning z element bilan P munosabatda bo'lishi kelib chiqsa, X to'plamdagi P munosabat **tranzitiv munosabat** deyiladi va $x\,P\,y,\ yPz \Rightarrow xPz$ ko'rinishida belgilanadi.

3.4-Ta'rif. Agar X to'plamning turli x va y elementlari uchun x elementning y element bilan P munosabatda bo'lishidan y elementning x element bilan P munosabatda bo'lmasligi kelib chiqsa, X to'plamdagi P munosabat **antisimmetrik munosabat** deyiladi va $x\,P\,y \quad\Rightarrow\quad y\,\overline{P}\,x$ ko'rinishida belgilanadi.

3.5-Ta'rif. $P \subseteq A \times A$ binar munosabat ham refleksivlik, ham simmetriklik, ham tranzitivlik shartlarini qanoatlantirsa, P munosabatga **ekvivalentlik munosabati** deyiladi, ya'ni P uchun

1) $\forall\, x \in A$ uchun xPx;
2) $x\,P\,y \;\Rightarrow\; y\,P\,x$;
3) $\forall\ (x,\ y) \in P,\ (y;z) \in P$ uchun $x\,P\,y$ va $y\,P\,z$ dan $x\,P\,z$ kelib chiqsa.

3.1-Misol. 1) "=" munosabati ekvivalentlik munosabati bo'ladi.

2) Qarindoshlik munosabati ekvivalentlik munosabati bo'ladi.

3) "Sevgi" munosabati ekvivalent munosabat bo`la olmaydi.

3.2-Misol. $A = Z$ butun sonlar to`plami va unda aniqlangan $P \subseteq Z \times Z$ munosabat shunday *x-y* larki, ular 3 ga bo`linadi.

a) *x-x=0* soni 3 ga bo`linadi.

b) *x-y* ifoda 3 ga bo`linsa, $y - x = -(x - y)$ ham 3 ga bo`linadi.

c) *x-y* ifoda 3 ga bo`linsa va *y-z* ifoda 3 ga bo`linsa, u holda $(x-y)+(y-z) = x - z$ ham 3 ga bo`linadi.

Demak, $P \subseteq Z \times Z = \{x \in Z, y \in Z \mid x - y \vdots 3 \quad \text{ga} \quad \text{bo'linadi}\}$ munosabat ekvivalentlik munosabati bo'lar ekan.

3.6-Ta'rif. $x \in A$ elementning **ekvivalentlik sinfi** deb, $E(x) = \{^{y}/_{x \sim y}\}$ to'plamga aytiladi.

3.7-Ta'rif. A to'plam elementlarining E ekvivalentlik bo'yicha ekvivalent sinflar to'plami **faktor – to'plam** deyiladi va $^{A}/_{E} = \{^{E(x)}/_{x \in A}\}$ kabi belgilanadi.

3.3-Misol. Agar *{(a;b), (c;d)}∈Q* to'plam elementlari uchun *a+d=b+c* tenglik bajarilsa, u holda *Q* munosabat *N×N* to'plamda ekvivalentlik munosabati bo'lini ko'rsating.

Yechilishi:

1) *Refleksivlik:* agar A to'plamda *Q* refleksivlik munosabati bo'lsa, u holda $\forall\, x \in Q,\ (x;x) \in Q$. Bizning misolda A t o'plam o'rnida *N×N* to'plam va *x* element

o'rnida *(x;y)* juftlik. Bunda $N \times N$ to'plamda Q munosabat refleksiv bo'ladi, agarda $\forall (x;y) \in Q,\ \{(x;y),(x;y)\} \in Q.$ Ta`rifga ko'ra, Q: $a+d=b+c$, lekin $a+b=b+a$, demak, Q - refleksiv munosabat.

2) *Simmetriklik:* agar $\{(a;b),\ (c;d)\} \in Q$ bo'lsa, u holda $\{(c;d),\ (a;b)\} \in Q$, $a+d=b+c$ bundan c+b= $d+a$. Demak, Q – simmetrik munosabat.

3) *Tranzitivlik:* agar $\{(a;b),\ (c;d)\} \in Q$, $\{(c;d),(f;g)\} \in Q$ bo'lsa, u holda $\{(a;b),(f;g)\} \in Q$ bo'ladi, chunki $a+d=b+c$ va c+$g=d+f$. U holda

$$(a+d)+(c+g)=(b+c)+(d+f) \Rightarrow a+d+c+g=b+c+d+f \Rightarrow a+g=b+f,$$

ya`ni Q – tranzitiv munosabat.

Demak, Q munosabat ham refleksiv, ham simmetrik, ham tranzitiv bo'lganligi uchun ekvivalent munosabat bo'ladi.

3.8-Ta'rif. Har bir elementi A to'plamning faqat va faqat bitta qism to'plamiga tegishli bo'lgan kesishmaydigan qism to'plamlar majmuasi A to'plamning **bo'laklari** deyiladi.

3.1-Teorema. A/E faktor-to'plam A to'plamning bo'lagi bo'ladi. Va aksincha, agar $R=\{A_i\}$ – A to'plamning biror bo'lagi bo'lsa, u holda bu bo'lakka biror i va A_i dan olingan $x;y$ elementlar uchun xEy qoida bo'yicha E ekvivalentlik munosabatini topish mumkin.

Munosabatning aniqlanish, qiymatlar sohalari.
Munosabatlar maydoni.

Biror A va B to`plamlar hamda unda aniqlangan $P \subseteq A \times B$ munosabat berilgan bo`lsin.

3.9-Ta'rif. P -munosabatning **chap sohasi** yoki **aniqlanish sohasi** $\boldsymbol{D_l}$ deb, P -munosabatga tegishli juftliklar birinchi elementlaridan iborat to'plamga aytiladi va $D_l=\{\exists x: (x,y) \in P\}$ kabi belgilanadi. *l*- *"left"*, ya`ni "chap" so`zidan olingan.

3.10-Ta'rif. P -munosabatning **o'ng sohasi** yoki **qiymatlar sohasi** D_r deb, P -munosabatga tegishli juftliklarning ikkinchi elementlar to'plamiga aytiladi va $D_r=\{\exists y: (x,y) \in P\}$ kabi belgilanadi. *r*- *"right"*, ya`ni "o`ng" so`zidan olingan.

Geometrik ma‘noda D_l - P munosabatning X to‘plamga proyektsiyasi, D_r - P munosabatning Y to’plamdagi proyektsiyasi hisoblanadi.

3.11-Ta’rif 3. Aniqlanish va qiymatlar sohalarining birlashmasi $D_l \cup D_r$ ga P **munosabat maydoni** deyiladi va $F(P)$ kabi belgilanadi.

P munosabatning chap va o‘ng sohalaridagi bir xil qiymatga ega bo‘lgan elementlari, ikkala tomonga ham tegishli deb hisoblanadi, xususan A^2 dekart kvadrat uchun $F(P) = A$ bo`ladi.

3.12-Ta’rif. $R^{-1} = \{(y, x): (x, y) \in R\}$ to‘plamga R munosabatga **teskari munosabat** deyiladi.

3.3-Misol. A={2, 3, 4, 5, 6, 7, 8} to‘plamda binar munosabat

$$R = \{(x, y): x, y \in A, x \text{ element } y \text{ ni bo`ladi va } x \le 3\}$$

shart bilan aniqlangan bo`lsin. U holda

R={(2,2), (2, 4), (2,6), (2, 8), (3, 3), (3, 6)};

D_l = {2, 3};

D_r={2, 3, 4, 6, 8};

R^{-1}= {(2, 2), (4, 2), (6, 2), (8, 2), (3, 3), (6, 3)}.

2. Mustaqil yechish uchun masalalar

2.1. Munosabatlarning turlarini aniqlashga doir topshiriqlar

A={a,b,c,d,e}, B={1,2,3,4} to‘plamlarda quyidagicha munosabatlar berilgan:

$R_1 \subseteq A \times B$ va $R_2 \subseteq B \times B = B^2$ bo’lsa,

1) R_1, R_2 munosabatlarni grafik ko‘rinishda ifodalang;
2) R_1, R_2 munosabatlarning aniqlanish va qiymatlar sohalarini toping;
3) $R_1, R_2, R_1^{-1}, R_2^{-1}, R_2^2$, $R_2 \cap R_2^{-1}$ - munosabatlarning matritsasini toping;
4) R_2 munosabatni refleksivlik, simmetriklik, antisimmetriklik, tranzitivlik xossalariga tekshirilsin.

2.1.1.

$$R_1 = \{<a;3>, <b;1>, <b;3>, <c;2>, <c;4>, <d;3>, <e;1>, <e;2>, <e;3>, <e;4>\},$$
$$R_2 = \{<1;4>, <2;1>, <2;2>, <2;3>, <3;2>, <3;3, <4;1>, <4;3>\}.$$

2.1.2.

$$R_1 = \{<a;1>,<a;3>,<a;4>,<d;3>,<c;1>,<c;3>,<c;4>,<d;1>,<d;3>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;4>,<2;1>,<2;3>,<3;2>,<4;1,<4;3>,<4;4>\}.$$

2.1.3.

$$R_1 = \{<a;1>,<a;3>,<b;1>,<b;3>,<c;1>,<c;3>,<d;3>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;2>,<1;4>,<2;3>,<3;2>,<3;4,<4;1>,<4;4>\}.$$

2.1.4.

$$R_1 = \{<a;3>,<b;3>,<c;2>,<c;3>,<c;4>,<d;2>,<d;3>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<1;2>,<1;4>,<2;1>,<2;3>,<3;2>,<3;4,<4;1>,<4;3>\}.$$

2.1.5.

$$R_1 = \{<a;3>,<a;4>,<b;2>,<b;3>,<c;2>,<c;3>,<c;4>,<d;3>,<d;2>,<d;4>\},$$
$$R_2 = \{<1;3>,<1;4>,<2;3>,<2;4>,<3;2>,<3;3,<4;1>,<4;3>\}.$$

2.1.6.

$$R_1 = \{<a;1>,<a;3>,<b;2>,<b;4>,<c;1>,<c;3>,<c;4>,<d;4>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;1>,<2;1>,<2;4>,<3;1>,<3;2>,<3;3,<3;4>,<4;4>\}.$$

2.1.7.

$$R_1 = \{<a;3>,<b;1>,<b;3>,<c;2>,<c;4>,<d;3>,<e;1>,<e;2>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;4>,<2;1>,<2;2>,<2;3>,<3;2>,<3;3,<4;1>,<4;3>\}.$$

2.1.8.

$$R_1 = \{<b;1>,<b;4>,<c;1>,<c;2>,<c;4>,<d;4>,<e;1>,<e;2>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;2>,<1;3>,<2;1>,<2;4>,<3;1,<3;4>,<4;4>\}.$$

2.1.9.

$$R_1 = \{<b;1>,<b;2>,<b;3>,<b;4>,<c;2>,<c;4>,<d;2>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<2;1>,<2;2>,<2;3>,<2;4>,<3;2>,<3;4,<4;2>,<4;4>\}.$$

2.1.10.

$$R_1 = \{<a;3>,<b;1>,<b;3>,<c;2>,<c;4>,<d;3>,<e;1>,<e;2>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;4>,<2;1>,<2;2>,<2;3>,<3;2>,<3;3,<4;1>,<4;3>\}.$$

2.1.11.

$$R_1 = \{<a;1>,<a;3>,<a;4>,<d;3>,<c;1>,<c;3>,<c;4>,<d;1>,<d;3>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;4>,<2;1>,<2;3>,<3;2>,<4;1,<4;3>,<4;4>\}.$$

2.1.12.

$$R_1 = \{<a;1>,<a;3>,<b;1>,<b;3>,<c;1>,<c;3>,<d;3>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;2>,<1;4>,<2;3>,<3;2>,<3;4,<4;1>,<4;4>\}.$$

2.1.13.

$$R_1 = \{<a;3>,<b;3>,<c;2>,<c;3>,<c;4>,<d;2>,<d;3>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<1;2>,<1;4>,<2;1>,<2;3>,<3;2>,<3;4,<4;1>,<4;3>\}.$$

2.1.14.

$$R_1 = \{<a;3>,<a;4>,<b;2>,<b;3>,<c;2>,<c;3>,<c;4>,<d;3>,<d;2>,<d;4>\},$$
$$R_2 = \{<1;3>,<1;4>,<2;3>,<2;4>,<3;2>,<3;3,<4;1>,<4;3>\}.$$

2.1.15.

$$R_1 = \{<a;1>,<a;3>,<b;2>,<b;4>,<c;1>,<c;3>,<c;4>,<d;4>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;1>,<2;1>,<2;4>,<3;1>,<3;2>,<3;3,<3;4>,<4;4>\}.$$

2.1.16.

$$R_1 = \{<a;3>,<b;1>,<b;3>,<c;2>,<c;4>,<d;3>,<e;1>,<e;2>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;4>,<2;1>,<2;2>,<2;3>,<3;2>,<3;3,<4;1>,<4;3>\}.$$

2.1.17.

$$R_1 = \{<b;1>,<b;4>,<c;1>,<c;2>,<c;4>,<d;4>,<e;1>,<e;2>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;2>,<1;3>,<2;1>,<2;4>,<3;1,<3;4>,<4;4>\}.$$

2.1.18.

$$R_1 = \{<b;1>,<b;2>,<b;3>,<b;4>,<c;2>,<c;4>,<d;2>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<2;1>,<2;2>,<2;3>,<2;4>,<3;2>,<3;4,<4;2>,<4;4>\}.$$

2.1.19.

$$R_1 = \{<a;3>,<b;1>,<b;3>,<c;2>,<c;4>,<d;3>,<e;1>,<e;2>,<e;3>,<e;4>\},$$
$$R_2 = \{<1;4>,<2;1>,<2;2>,<2;3>,<3;2>,<3;3,<4;1>,<4;3>\}.$$

2.1.20.

$$R_1 = \{<a;1>,<a;3>,<a;4>,<d;3>,<c;1>,<c;3>,<c;4>,<d;1>,<d;3>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;4>,<2;1>,<2;3>,<3;2>,<4;1,<4;3>,<4;4>\}.$$

2.1.21.

$$R_1 = \{<a;1>,<a;3>,<b;1>,<b;3>,<c;1>,<c;3>,<d;3>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<1;1>,<1;2>,<1;4>,<2;3>,<3;2>,<3;4,<4;1>,<4;4>\}.$$

2.1.22.

$$R_1 = \{<a;3>,<b;3>,<c;2>,<c;3>,<c;4>,<d;2>,<d;3>,<d;4>,<e;2>,<e;4>\},$$
$$R_2 = \{<1;2>,<1;4>,<2;1>,<2;3>,<3;2>,<3;4,<4;1>,<4;3>\}.$$

2.1.23.

$$R_1 = \{<a;3>,<a;4>,<b;2>,<b;3>,<c;2>,<c;3>,<c;4>,<d;3>,<d;2>,<d;4>\},$$
$$R_2 = \{<1;3>,<1;4>,<2;3>,<2;4>,<3;2>,<3;3,<4;1>,<4;3>\}.$$

2.1.24.

$R_1 = \{<a;1>, <a;3>, <b;2>, <b;4>, <c;1>, <c;3>, <c;4>, <d;4>, <e;3>, <e;4>\}$,

$R_2 = \{<1;1>, <2;1>, <2;4>, <3;1>, <3;2>, <3;3, <3;4>, <4;4>\}$.

2.1.25.

$R_1 = \{<a;3>, <b;1>, <b;3>, <c;2>, <c;4>, <d;3>, <e;1>, <e;2>, <e;3>, <e;4>\}$,

$R_2 = \{<1;4>, <2;1>, <2;2>, <2;3>, <3;2>, <3;3, <4;1>, <4;3>\}$.

2.1.26.

$R_1 = \{<b;1>, <b;4>, <c;1>, <c;2>, <c;4>, <d;4>, <e;1>, <e;2>, <e;3>, <e;4>\}$,

$R_2 = \{<1;1>, <1;2>, <1;3>, <2;1>, <2;4>, <3;1, <3;4>, <4;4>\}$.

2.1.27.

$R_1 = \{<b;1>, <b;2>, <b;3>, <b;4>, <c;2>, <c;4>, <d;2>, <d;4>, <e;2>, <e;4>\}$,

$R_2 = \{<2;1>, <2;2>, <2;3>, <2;4>, <3;2>, <3;4, <4;2>, <4;4>\}$.

2.2. Ekvivalentlik munosabatiga doir topshiriqlar

2.2.1. Birdan farqli natural sonlar to‘plami dekart kvadratida aniqlangan R={***(x,y)*:** ***x*** va ***y*** lar birdan farqli umumiy bo‘luvchiga ega} munosabat ekvivalent munosabat bo‘ladimi?

2.2.2. A={*a, b, c*} to‘plam dekart kvadratida simmetrik bo‘lgan, refleksiv, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.3. A={*a, b, c*} to‘plam dekart kvadratida tranzitiv bo‘lgan, refleksiv, simmetrik bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.4. A={*a, b, c*} to‘plam dekart kvadratida refleksiv, simmetrik bo‘lgan, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.5. K-kalit so‘zlar, P- web sahifalar to‘plami bo‘lsin, R munosabat ushbu to‘plamlar dekart ko‘paytmasida aniqlangan bo‘lsin. ***(x,y)*** juftlik R munosabatga tegishli bo‘lsin, agar ***x*** kalit so‘z ***y*** web-sahifada bo‘lsa. R munosabat ekvivalent munosabat bo‘ladimi?

2.2.6. A={1,2,3,4} to‘plam dekart kvadratida refleksiv bo‘lgan, simmetrik, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.7. A={1,2,3,4} to‘plam dekart kvadratida refleksiv, simmetrik, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.8. A={1,2,3,4} to‘plam dekart kvadratida ekvivalent munosabatga misol keltiring va isbotlang.

2.2.9. Birdan farqli natural sonlar to‘plami dekart kvadratida aniqlangan R={**(*x*,*y*):** ***x*** va ***y*** lar birdan farqli umumiy bo‘luvchiga ega} munosabat ekvivalent munosabat bo‘ladimi?

2.2.10. A={*a, b, c*} to‘plam dekart kvadratida simmetrik bo‘lgan, refleksiv, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.11. A={*a, b, c*} to‘plam dekart kvadratida tranzitiv bo‘lgan, refleksiv, simmetrik bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.12. A={*a, b, c*} to‘plam dekart kvadratida refleksiv, simmetrik bo‘lgan, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.13. K-kalit so‘zlar, P- web sahifalar to‘plami bo‘lsin, R munosabat ushbu to‘plamlar dekart ko‘paytmasida aniqlangan bo‘lsin. ***(x,y)*** juftlik R munosabatga tegishli bo‘lsin, agar ***x*** kalit so‘z ***y*** web-sahifada bo‘lsa. R munosabat ekvivalent munosabat bo‘ladimi?

2.2.14. A={1,2,3,4} to‘plam dekart kvadratida refleksiv bo‘lgan, simmetrik, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.15. A={1,2,3,4} to‘plam dekart kvadratida refleksiv, simmetrik, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.16. A={1,2,3,4} to‘plam dekart kvadratida ekvivalent munosabatga misol keltiring va isbotlang.

2.2.17. Birdan farqli natural sonlar to‘plami dekart kvadratida aniqlangan R={**(*x*,*y*):** ***x*** va ***y*** lar birdan farqli umumiy bo‘luvchiga ega} munosabat ekvivalent munosabat bo‘ladimi?

2.2.18. A={*a, b, c*} to‘plam dekart kvadratida simmetrik bo‘lgan, refleksiv, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.19. A={*a, b, c*} to‘plam dekart kvadratida tranzitiv bo‘lgan, refleksiv, simmetrik bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.20. A={*a, b, c*} to‘plam dekart kvadratida refleksiv, simmetrik bo‘lgan, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.21. K-kalit so‘zlar, P- web sahifalar to‘plami bo‘lsin, R munosabat ushbu to‘plamlar dekart ko‘paytmasida aniqlangan bo‘lsin. ***(x,y)*** juftlik R munosabatga tegishli bo‘lsin, agar ***x*** kalit so‘z ***y*** web-sahifada bo‘lsa. R munosabat ekvivalent munosabat bo‘ladimi?

2.2.22. A={1,2,3,4} to‘plam dekart kvadratida refleksiv bo‘lgan, simmetrik, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.23. A={1,2,3,4} to‘plam dekart kvadratida refleksiv, simmetrik, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.24. A={1,2,3,4} to‘plam dekart kvadratida ekvivalent munosabatga misol keltiring va isbotlang.

2.2.25. Birdan farqli natural sonlar to‘plami dekart kvadratida aniqlangan R={***(x,y):*** ***x*** va ***y*** lar birdan farqli umumiy bo‘luvchiga ega} munosabat ekvivalent munosabat bo‘ladimi?

2.2.26. A={*a, b, c*} to‘plam dekart kvadratida simmetrik bo‘lgan, refleksiv, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.27. A={*a, b, c*} to‘plam dekart kvadratida tranzitiv bo‘lgan, refleksiv, simmetrik bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.28. A={*a, b, c*} to‘plam dekart kvadratida refleksiv, simmetrik bo‘lgan, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.

2.2.29. K-kalit so‘zlar, P- web sahifalar to‘plami bo‘lsin, R munosabat ushbu to‘plamlar dekart ko‘paytmasida aniqlangan bo‘lsin. ***(x,y)*** juftlik R munosabatga tegishli bo‘lsin, agar ***x*** kalit so‘z ***y*** web-sahifada bo‘lsa. R munosabat ekvivalent munosabat bo‘ladimi?

2.2.30. A={1,2,3,4} to‘plam dekart kvadratida refleksiv bo‘lgan, simmetrik, tranzitiv bo‘lmagan munosabatga misol keltiring va isbotlang.