O’ZBEKISTON RESPUBLIKASI

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# REFERAT

Mavzu: Funksiyalar sistemasining to’liqligi. Funksional yopiq sinflar va post teoremasi

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**Reja:**

1.Funksiyalar sistemasining to’liqligi.

2.Funksional yopiq sinflar.

3.Post teoremasi.

**Funksional yopiq sinflar.** Mantiq algebrasining $\Phi=\{\varphi_1,...,\varphi_n\}$ funksiyalar sistemasi berilgan bo‘lsin.

**1- t a ’ r i f.** *Agar mantiq algebrasining istalgan funksiyasini* $\Phi=\{\varphi_1,...,\varphi_n\}$ *sistemadagi funksiyalar superpozitsiyasi orqali ifodalash mumkin bo‘lsa, u holda* $\Phi$ *sistema **to‘liq funksiyalar sistemasi** deb ataladi.*

**2- t a ’ r i f.** *Mantiq algebrasining superpozitsiyaga nisbatan yopiq bo‘lgan har qanday funksiyalar sistemasi **funksional yopiq sinf** deb ataladi.*

**3- t a ’ r i f.** *O‘z-o‘zidan va mantiq algebrasining hamma funksiyalari sinfidan (*$P_2$ *dan) farq qiluvchi funksional yopiq sinflarga kirmaydigan xususiy funksional yopiq sinf **maksimal funksional yopiq sinf** deb ataladi.*

Mantiq algebrasida hammasi bo‘lib beshta maksimal funksional yopiq sinf mavjud. Bular quyidagilardir: $P_0, P_1, M, S, L$.

**Post teoremasi.** E. L. Post tomonidan funksiyalar sistemasi to‘liqligining yetarli va zarur shartlari topilgan.

**P o s t  t e o r e m a s i.** $\Phi=\{\varphi_1,...,\varphi_n\}$ *funksiyalar sistemasi to‘liq bo‘lishi uchun bu sistemada* $P_0, P_1, M, S, L$ *maksimal funksional yopiq sinflarning har biriga kirmaydigan kamida bitta funksiya mavjud bo‘lishi*

## Ikki taraflama funksiya.

**1- t a ’ r i f.** *Quyidagicha aniqlangan*

$$f^*(x_1,x_2,...,x_n)=\bar f(\bar x_1,\bar x_2,...,\bar x_n)$$

1- jadval

| Berilgan funksiya | Ikki taraflama funksiya |
|---|---|
| $f_1(x)=x$ | $f_1^*(x)=x$ |
| $f_2(x)=\bar x$ | $f_2^*(x)=\bar x$ |
| $f_3(x,y)=xy$ | $f_3^*=x\vee y$ |
| $f_4(x,y)=x\vee y$ | $f_4^*=x\,y$ |
| $f_5(x,y)=x\to y$ | $f_5^*=\overline{y\to x}$ |

| | |
|---|---|
| $f_6(x,y)=x\leftrightarrow y$ | $f_6^*=\overline{x\leftrightarrow y}$ |
| $f_7=1$ | $f_7^*=0$ |
| $f_8=0$ | $f_8^*=1$ |

*funksiyaga* $f(x_1,x_2,...,x_n)$ *funksiyaning* ***ikki taraflama funksiyasi*** *deb aytiladi.*

**2- ta'rif.** *Agar*

$$f(x_1,x_2,...,x_n)=f^*(x_1,x_2,...,x_n)=\overline{f}(\overline{x}_1,\overline{x}_2,...,\overline{x}_n)$$

*munosabat bajarilsa, u holda* $f(x_1,x_2,...,x_n)$ ***o'z-o'ziga ikki taraflama funksiya*** *deb ataladi.*

**Jegalkin ko'phadi.**

**1- ta'rif.** $\sum x_{i_1}x_{i_2}...x_{i_k}+a$ *ko'rinishdagi ko'phad* ***Jegalkin ko'phadi*** *deb ataladi, bu yerda hamma* $x_{i_j}$ *o'zgaruvchilar birinchi darajada qatnashadi,* $(i_1,...,i_k)$ *qiymatlar satrida hamma* $i_j$ *lar har xil bo'ladi,* $a\in E_2=\{0,1\}$.

**2- ta'rif.** $x_{i_1}+x_{i_2}+...+x_{i_k}+a$ *ko'rinishdagi funksiya* ***chiziqli funksiya*** *deb ataladi.*

**Mantiq algebrasidagi monoton funksiyalar.**

**Tartiblash.** 0<1 munosabati orqali {0,1} to'plamini tartiblashtiramiz. $\alpha=(\alpha_1,...,\alpha_n)$ va $\beta=(\beta_1,...,\beta_n)$ qiymatlar satrlari bo'lsin.

**1- ta'rif.** *Agar* $\alpha_i\le\beta_i$ *tengsizlik hech bo'lmaganda bitta* $i$ *uchun bajarilsa yoki* $\alpha$ *va* $\beta$ *qiymatlar satrlari ustma-ust tushsa, u holda* $\alpha$ ***qiymatlar satri*** $\beta$ ***qiymatlar satridan oldin keladi*** *deb aytamiz va* $\alpha\prec\beta$ *shaklda yozamiz.*

**2- ta'rif.** *Agar* $\alpha\prec\beta$ *munosabatdan* $f(\alpha_1,...,\alpha_n)\le f(\beta_1,...,\beta_n)$ *tengsizlikning bajarilishi kelib chiqsa, u holda* $f(x_1,...,x_n)$ *funksiya* ***monoton funksiya*** *deb ataladi.*

**3- ta'rif** *Agar* $\alpha\prec\beta$ *munosabatdan* $f(\alpha_1,...,\alpha_n)>f(\beta_1,...,\beta_n)$ *tengsizlikning bajarilishi kelib chiqsa, u holda* $f(x_1,...,x_n)$ ***nomonoton funksiya*** *deb ataladi.*

**1- teorema.** *Monoton funksiyalarning superpozitsiyasidan hosil qilingan funksiya ham monoton funksiya bo'ladi.*

**2- teorema.** *Agar* $f(x_1,...,x_n) \in M$ *bo‘lsa, u holda undan argumentlari o‘rniga 0, 1 va x funksiyani qo‘yish usuli bilan* $\bar{x}$ *funksiyani hosil qilish mumkin.*

**4-ta’rif.** *Agar* $f(x_1, x_2,..., x_n)$ *funksiya uchun* $f(0,0,...,0) \equiv 0$ *bo’lsa, u holda u* ***0 saqlovchi funksiya****,* $f(1,1,...,1) \equiv 1$ *bo’lganda esa* ***1 saqlovchi funksiya*** *deb ataladi.*

| Post jadvali | | | | | |
|---|---|---|---|---|---|
| | $P_0$ | $P_1$ | $S$ | $L$ | $M$ |
| $\varphi_1$ | | | | | |
| $\varphi_2$ | | | | | |
| ... | ... | ... | ... | ... | ... |
| $\varphi_n$ | | | | | |

Amalda berilgan $\Phi = \{\varphi_1,...,\varphi_n\}$ funksiyalar sistemasining to‘liq yoki to‘liq emasligini aniqlash uchun **Post jadvali** deb ataluvchi jadvaldan foydalaniladi. Post jadvali quyida keltirilgan.

Jadvalning xonalariga o‘sha satrdagi funksiya funksional yopiq sinflarning elementi bo‘lsa “+” ishora, bo‘lmasa “–” ishorasi qo‘yiladi. $\Phi = \{\varphi_1,...,\varphi_n\}$ sistema to‘liq funksiyalar sistemasi bo‘lishi uchun, Post teoremasiga asosan, jadvalning har bir ustunida kamida bitta “–” ishorasi bo‘lishi yetarli va zarur.

Demak, Post teoremasi shartidan $P_0, P_1, M, S, L$ maksimal funksional yopiq sinflarning birortasini ham olib tashlash mumkin emas. Bu xulosadan, o‘z navbatida, $P_0, P_1, M, S, L$ maksimal funksional yopiq sinflarning birortasi ham boshqasining qism to‘plami bo‘la olmasligi kelib chiqadi. ■

## XULOSA

1. Funksiyalar sistemasining to’liqligi tushunchasi maliy jihatdan muhim ahamiyatga ega ekanligi ko’rsatildi.

2.Funksional yopiq sinflarnig ta’rifiga ko’ra, 0 va 1 saqlovchi hamda monoton, o’z-o’ziga qo’shma, chiziqli funksiyalar xususiyati o’rganildi;

3. Post teoremasi natijalarini amaliy tadbiqi o’rganildi.

**Quyida berilgan funksiyalar sinfining to’liqligini Post jadvali yordamida tekshiring;**

$$F=\{((x_1\to\overline{x_2})\oplus(x_2\to\overline{x_3}))\leftrightarrow(x_2\to x_3);\ (x_2\to x_1)\cdot(x_2\downarrow x_2);$$

$$((x_1\vee x_2\cdot\overline{x_3})\to(x_2\to x_1\cdot x_3))\leftrightarrow(x_1\vee x_3)\};$$

**Berilgan funksiyalar sinfining to’liqligini Post jadvali yordamida tekshirish uchun quyidagi ketma-ketlikdagi ishlarni amalga oshiramiz:**

**1-ish.** Berilgan formulada qatnashayotgan o’zgaruvchilar sonini aniqlab, jadvalning o’zgaruvchilar ustunini to’ldiramiz.

Berilgan formulada uchta o`zgaruvchi qatnashgan, ya’ni *x* , *y va z* o`zgaruvchilar. Demak $N=2^n$ formula orqali o`zgaruvchilarning nechta qiymat qabul qilishini topamiz.

Berilgan formulada uchta o`zgaruvchi qatnashganligi uchun o`zgaruvchilarning har biri 8 tadan qiymat qabul qiladi. Buni quydagi jadvalda o`zgaruvchilarning va ularning inkorlarini qiymatlarini keltiramiz. (1-jadval).

**1.1-ish.** Quyidagi formulani chinlik jadvalini yuqoridagi ta’riflardan foydalanib tuzamiz:

$$F=\{((x_1\to\overline{x_2})\oplus(x_2\to\overline{x_3}))\leftrightarrow(x_2\to x_3);$$

**1.2-ish.** $((x_1\to\overline{x_2})\oplus(x_2\to\overline{x_3}))\leftrightarrow(x_2\to x_3)$ ning qiymatini topamiz: (1-jadval)

**1-jadval**

$a=x_1\to\overline{x_2};\ b=x_2\to\overline{x_3};\ c=x_2\to x_3;$ deb belgilash kiritib olamiz.

| $x_1$ | $x_2$ | $x_3$ | $\overline{x_2}$ | $\overline{x_3}$ | $x_1\to\overline{x_2}$ | $x_2\to\overline{x_3}$ | $x_2\to x_3$ | $a\oplus b$ | $(a\oplus b)\leftrightarrow c$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

**Xulosa:** Ushbu $((x_1 \to \overline{x_2}) \oplus (x_2 \to \overline{x_3})) \leftrightarrow (x_2 \to x_3)$ formulaning chinlik jadvali {00110000}.

**2-ish .** Endi quyidagi formulani chinlik jadvalini yuqoridagi ta'riflardan foydalanib tuzamiz:

$$(x_2 \to x_1) \cdot (x_2 \downarrow x_2);$$

**2.1-ish.** $(x_2 \to x_1) \cdot (x_2 \downarrow x_2);$ ning qiymatini topamiz: (2-jadval)

**2-jadval**

| $x_1$ | $x_2$ | $x_2 \to x_1$ | $x_2 \downarrow x_2$ | $(x_2 \to x_1) \cdot (x_2 \downarrow x_2)$ |
|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |

**Xulosa:** Ushbu $(x_2 \to x_1) \cdot (x_2 \downarrow x_2);$ formulaning chinlik jadvali *f*={1010}.

**3-ish .** Endi quyidagi formulani chinlik jadvalini yuqoridagi ta'riflardan foydalanib tuzamiz:

$$((x_1 \vee x_2 \cdot \overline{x_3}) \to (x_2 \to x_1 \cdot x_3)) \leftrightarrow (x_1 \vee x_3);$$

**3.1-ish.** $((x_1 \vee x_2 \cdot \overline{x_3}) \to (x_2 \to x_1 \cdot x_3)) \leftrightarrow (x_1 \vee x_3);$ ning qiymatini topamiz.(3-jadval)

**3-jadval**

$a = x_1 \vee x_2 \cdot \overline{x_3}$; $b = x_2 \to x_1 \cdot x_3$; $c = x_1 \vee x_3$; deb belgilash kiritib oldim.

Xulosa: Ushbu $((x_1 \vee x_2 \cdot \overline{x_3}) \to (x_2 \to x_1 \cdot x_3)) \leftrightarrow (x_1 \vee x_3)$; formulaning chinlik jadvali *f*={01111101}.

Kiyingi qiladigan ishim 3 ta funksiyani ham **Post** jadvaliga tekshiramiz.

**1-ish.** Formulalarni $P_0$ yopiq sinfga tegishli yoki tegishli emasligi tekshiramiz.

1) $f_1(x, y, z) =$ $((x_1 \to \overline{x_2}) \oplus (x_2 \to \overline{x_3})) \leftrightarrow (x_2 \to x_3)$

$f_1(0,0,0) = ((0 \to 1) \oplus (0 \to 1)) \leftrightarrow (0 \to 0) = 0$ demak $f_1$ formula $P_0$ yopiq sinfga tegishli ekan.

2) $f_1(x, y, z) = (x_2 \to x_1) \cdot (x_2 \downarrow x_2)$;

$f_2(0,0,0) = (0 \to 0)(0 \downarrow 0) = 1$ demak $f_2$ formula $P_0$ yopiq sinfga tegishli emas ekan.

3) $f_3(x, y, z) = ((x_1 \vee x_2 \cdot \overline{x_3}) \to (x_2 \to x_1 \cdot x_3)) \leftrightarrow (x_1 \vee x_3)$;

$f_3(0,0,0) = ((0 \vee 0 \cdot 1) \to (0 \to 0 \cdot 0)) \leftrightarrow (0 \vee 0) = 0$ demak $f_3$ formula $P_0$ yopiq sinfga tegishli ekan.

**2-ish**. Formulalarni $P_1$ yopiq sinfga tegishli yoki tegishli emasligi tekshiramiz.

1) $f_1(x, y, z) =$ $((x_1 \to \overline{x_2}) \oplus (x_2 \to \overline{x_3})) \leftrightarrow (x_2 \to x_3)$

| $x_1$ | $x_2$ | $x_3$ | $\overline{x_3}$ | $x_2\overline{x_3}$ | $a$ | $x_1x_3$ | $b$ | $a \to b$ | $c$ | $(a \to b) \leftrightarrow c$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

$f_1(1,1,1) = ((1 \to 0) \oplus (1 \to$ demak $f_1$ formula $P_1$ yopiq sinfga tegishli emas ekan.

2) $f_1(x, y, z) =$ $(x_2 \to x_1) \cdot (x_2 \downarrow x_2)$;

$f_2(1,1,1) = (1 \to 1)(1 \downarrow 1) =$

demak $f_2$ formula $P_1$ yopiq sinfga tegishli emas ekan.

3) $f_3(x,y,z) = ((x_1 \vee x_2 \cdot \overline{x_3}) \to (x_2 \to x_1 \cdot x_3)) \leftrightarrow (x_1 \vee x_3);$

$f_3(1,1,1) = ((1 \vee 1 \cdot 0) \to (1 \to 1 \cdot 1)) \leftrightarrow (1 \vee 1) = 1$demak $f_3$ formula $P_1$ yopiq sinfga tegishli ekan.

**3-ish.** o‘z-o‘ziga ikki taraflama funksiyalar sinfi;

**1)** $F = (\overline{(\overline{x_1} \to x_2) \oplus (\overline{x_2} \to x_3)) \leftrightarrow (\overline{x_2} \to \overline{x_3})};$

$a = \overline{x_1} \to x_2;\ b = \overline{x_2} \to x_3;\ c = \overline{x_2} \to \overline{x_3};$ deb belgilash kiritib olamiz.

| $x_1$ | $x_2$ | $x_3$ | $\overline{x_1}$ | $\overline{x_2}$ | $\overline{x_3}$ | $\overline{x_1} \to x_2$ | $\overline{x_2} \to x_3$ | $a \oplus b$ | $\overline{x_2} \to \overline{x_3}$ | $(a \oplus b) \leftrightarrow c$ | $F^*$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |

**Demak:** $F^* \neq F$ funksiya o’z-o’ziga ikki taraflama emas ekan.

**2)** $F^* = \overline{(\overline{x_2} \to \overline{x_1})(\overline{x_2} \downarrow \overline{x_2})};$

| $\overline{x_1}$ | $\overline{x_2}$ | $\overline{x_2} \to \overline{x_1}$ | $\overline{x_2} \downarrow \overline{x_2}$ | $F^*$ |
|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 |

**Demak:** $F^* = F$ funksiya o’z-o’ziga ikki taraflama ekan.

**3)** $F^* = (\overline{(\overline{x_1} \vee \overline{x_2} \cdot x_3) \to (\overline{x_2} \to \overline{x_1}\,\overline{x_3})) \leftrightarrow (\overline{x_1} \vee \overline{x_3})};$

$a = \overline{x_1} \vee \overline{x_2} \cdot x_3;$**;** $b = \overline{x_2} \to \overline{x_1}\,\overline{x_3};\ c = \overline{x_1} \vee \overline{x_3};$ deb belgilash kiritib oldim.

**Demak:** $F^* \neq F$ funksiya o’z-o’ziga ikki taraflama emas ekan.

**4-ish.** Formulalarni chiziqli yoki chiziqli emasligiga tekshiramiz. Buning uchun

| $x_1$ | $x_2$ | $x_3$ | $\overline{x_1}$ | $\overline{x_2}$ | $\overline{x_3}$ | $\overline{x_2}x_3$ | $a$ | $\overline{x_1}\,\overline{x_3}$ | $b$ | $c$ | $a \to b$ | $(a \to b) \leftrightarrow c$ | $F^*$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |

chinlik jadvalidagi oxirgi natijalardan foydalanamiz.

1) $f_1(x, y, z) = ((x_1 \to \overline{x_2}) \oplus (x_2 \to \overline{x_3})) \leftrightarrow (x_2 \to x_3)$

$L_1 = a_0xyz + a_1xy + a_2xz + a_3yz + a_4x + a_5y + a_6z + b;$

$f(0,0,0) = 0 = a_0 000 + a_1 00 + a_2 00 + a_3 0 + a_4 0 + a_5 0 + a_6 0 + b,$ demak $b = 0$

$f(0,0,1) = 0 = a_6 1 + 0$ demak $a_6 = 0$

$f(0,1,0) = 1 = a_5 1 + 0$ demak $a_5 = 1$

$f(0,1,1) = 1 = a_3 11 + a_5 1 + a_6 1 + 0$ demak $a_3 = 0$

$f(1,0,0) = 0 = a_4 1 + 0$ demak $a_4 = 0$

$f(1,0,1) = 0 = a_2 11 + a_4 + a_6 + 0$ demak $a_2 = 0$

$f(1,1,0) = 0 = a_1 11 + a_4 + a_5 + 0$ demak $a_1 = 1$

$f(1,1,1) = 0 = a_0 111 + 1 + 0 + 0 + 0 + 1 + 0 + 0$ demak $a_0 = 0$ bundan kelib chiqadiki

$L = xy + y$ chiziqli emas ekan.

2) $f_1(x, y, z) = (x_2 \to x_1) \cdot (x_2 \downarrow x_2);$

$L_1 = a_0xy + a_1x + a_2y + b;$

$f(0,0) = 1 = a_0 00 + a_1 0 + a_2 0 + b,$ demak $b = 1$

$f(0,1) = 0 = a_0 01 + a_1 0 + a_2 1 + 1$ demak $a_2 = 1$

$f(1,0)=1=a_0 10+a_1 1+a_2 0+1$ demak $a_1=1$

$f(1,1)=0=a_0 11+a_1 1+a_2 1+1$ demak $a_0=1$ bundan kelib chiqadiki

$L=xy+x+y+1$chiziqli emas ekan.

3) $f_1(x,y,z)=((x_1\vee x_2\cdot\overline{x_3})\to(x_2\to x_1\cdot x_3))\leftrightarrow(x_1\vee x_3);$

$L_1=a_0xyz+a_1xy+a_2xz+a_3yz+a_4x+a_5y+a_6z+b;$

$f(0,0,0)=0=a_0 000+a_1 00+a_2 00+a_3 0+a_4 0+a_5 0+a_6 0+b,$ demak $b=0$

$f(0,0,1)=1=a_6 1+0$ demak $a_6=1$

$f(0,1,0)=1=a_5 1+0$ demak $a_5=1$

$f(0,1,1)=1=a_3 11+a_5 1+a_6 1+0$ demak $a_3=1$

$f(1,0,0)=1=a_4 1+0$ demak $a_4=1$

$f(1,0,1)=1=a_2 11+a_4+a_6+0$ demak $a_2=1$

$f(1,1,0)=0=a_1 11+a_4+a_5+0$ demak $a_1=0$

$f(1,1,1)=1=a_0 111+0+1+1+1+1+1+0$ demak $a_0=0$ bundan kelib chiqadiki

$L=xz+yz+x+y+z$ chiziqli emas ekan.

5-ish formulalarni monotonlikka tekshiramiz.

1) $f_1(x,y,z)=$ $((x_1\to\overline{x_2})\oplus(x_2\to\overline{x_3}))\leftrightarrow(x_2\to x_3)$

(0,1,1)$\prec$(1,0,0) va $f$(0,1,1)>$f$(1,0,0) demak $f_1$ formula monoton emas.

2) $f_1(x,y,z)=(x_2\to x_1)\cdot(x_2\downarrow x_2);$

(0,0)$\prec$(0,1) va $f$(0,0)>$f$(0,1) demak $f_2$ formula monoton emas

3) $f_1(x,y,z)=$ $((x_1\vee x_2\cdot\overline{x_3})\to(x_2\to x_1\cdot x_3))\leftrightarrow(x_1\vee x_3);$

(1,0,1)$\prec$(1,1,0) va $f$(1,0,1)>$f$(1,1,0) demak $f_3$ formula monoton emas

**Endi Post jadvalini tuzamiz:**

| | $P_0$ | $P_1$ | $S$ | $L$ | $M$ |
|---|---|---|---|---|---|
| $f_1$ | + | - | - | - | - |
| $f_2$ | - | - | + | - | - |
| $f_3$ | + | + | - | - | - |