



«TOSHKENT IRRIGATSIYA VA QISHLOQ
XO'JALIGINI MEXANIZATSIYALASH
MUHANDISLARI INSTITUTI» MTU



FAN:

QURILISH MEXANIKASI

MAVZU

2

**Harakatlanuvchi yuklar va ta'sir
chiziqlar nazariyasi haqida
tushuncha**



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Mexanika va kompyuterli
modellashtirish kafedrası dotsenti



Adabiyotlar

1. Тўраев Х.Ш., Исматов М.Х., Юлдашев Ф.Х., Жавлиев Б.К. “Қурилиш механикаси назарий асослари ва амалий масалалар”, Ўқув қўлланма. Т.: “Молия”, 2002.- 432 б.
2. Одилхўжаев Э.А., Ғуломов Т.Г., Абдукомиллов Т.К. “Қурилиш механикаси”, Дарслик. Т.: “Ўқитувчи”, 1985.- 272 б.
3. Абдурашидов К.С., Хабилов Б.А., Тўйчиев Н.Ж., Рахимбоев А.Ф. “Қурилиш механикаси”, Ўқув қўлланма, Т.: «Ўзбекистон». 1999.– 384 б.

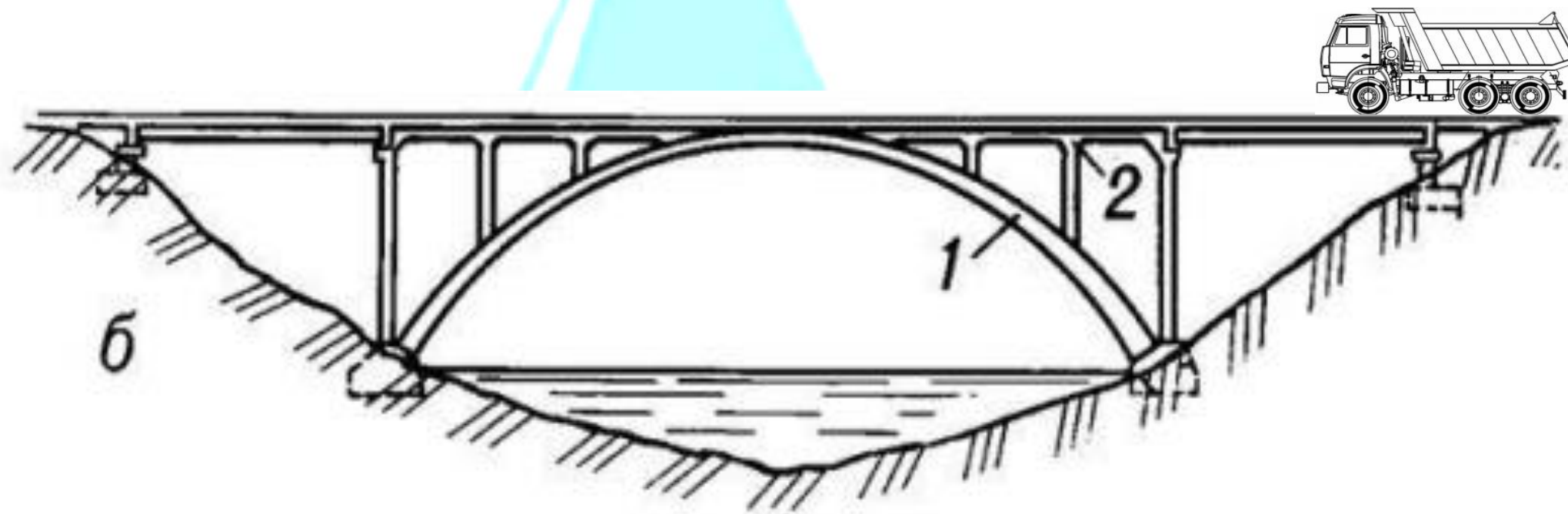
R e j a:

- 1. Harakatlanuvchi yuklar va ta'sir chiziqlar nazariyasi haqida tushuncha.***
- 2. Oddiy balka va konsol balkalarda ta'sir chiziqlar qurish.***
- 3. Ta'sir chiziqlari yordamida zo'riqishlarni aniqlash.***

Tayanch so'z va lboralar

harakatlanuvchi yuklar va ta'sir chiziqlar nazariyasi, ta'sir chiziqlarni chizishning statik va kinematik usullari, oddiy balka tayanch reaksiyalarining ta'sir chizig'i, oddiy balkaning ixtiyoriy kesimida ko'ndalang kuch Q va eguvchi moment M larning ta'sir chiziqlari, konsolli balkalar zo'riqishlarining ta'sir chiziqlari, konsol balkaning zo'riqishlarini ta'sir chiziqlari, ikki konsolli balka zo'riqishlarining ta'sir chiziqlarini qurish tartibi.

Harakatlanuvchi yuklar va ta'sir chiziqlar nazariyasi haqida tushuncha

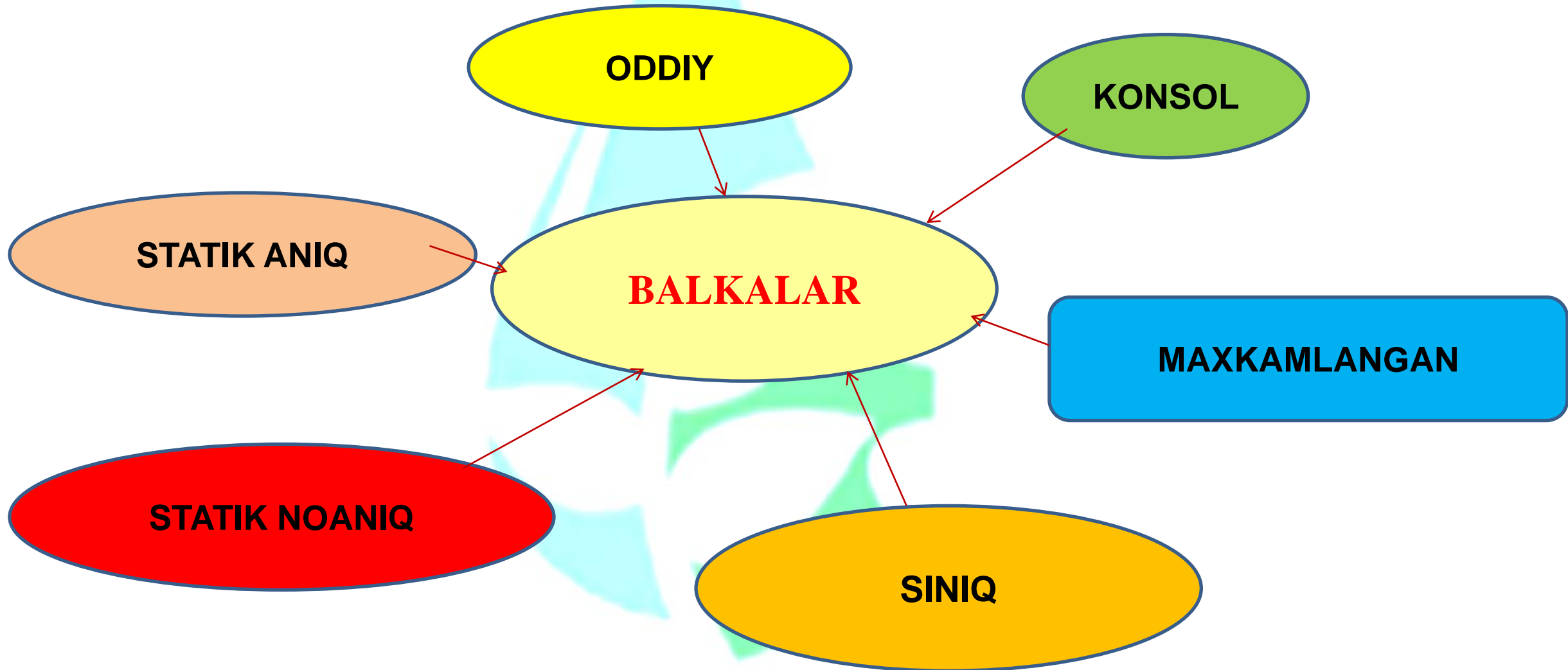


Harakatlanuvchi yuklar va ta'sir chiziqlar nazariyasi haqida tushuncha

Inshoot bo'ylab birlik kuch ($P=1$) harakat qilganida uning elementlarida (tayanch reaksiyalar yoki ixtiyoriy kesimida) hosil bo'ladigan zo'riqishlar miqdorining o'zgarishini ifodalovchi grafik shu zo'riqishlarning ta'sir chizig'i deyiladi.

$$R_A=f_1(x); \quad R_B=f_2(x); \quad M=f_3(x); \quad Q=f_4(x).$$

Klaster



Oddiy balkalarda ta'sir chiziqlar qurish

A tayanch reaksiyasining ta'sir chizig'ini qurish.

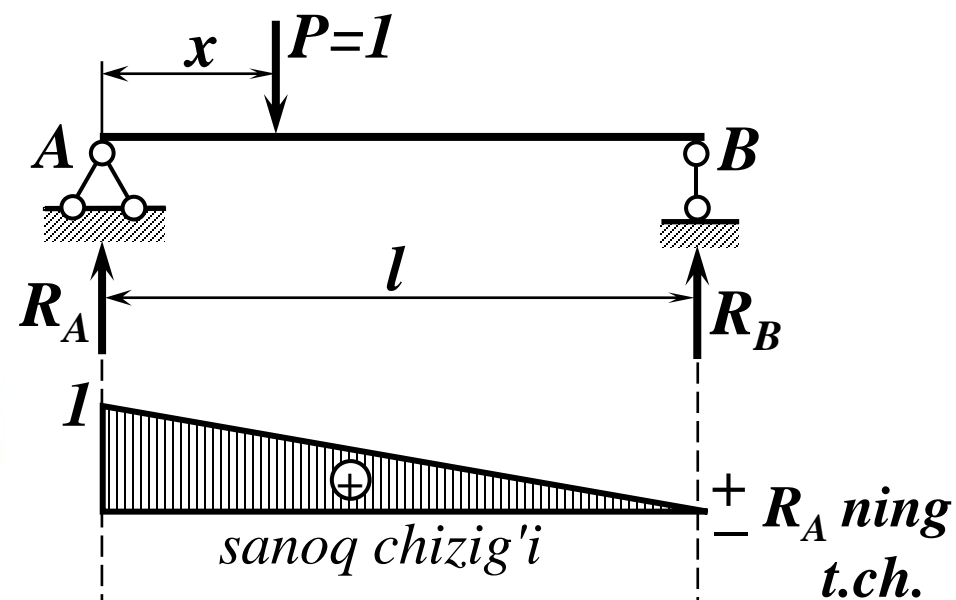
$$\sum M_B = 0; \quad R_A \cdot l - P(l - x) = 0,$$

$$R_A = P \frac{l - x}{l} = \frac{l - x}{l}$$

$$0 \leq x \leq l$$

$X=0$ da $R_A=1$;

$X=l$ bo'lganda $R_A=0$ bo'ladi.



Oddiy balka balkalarda ta'sir chiziqlar qurish

B tayanch reaksiyasining ta'sir chizig'ini qurish.

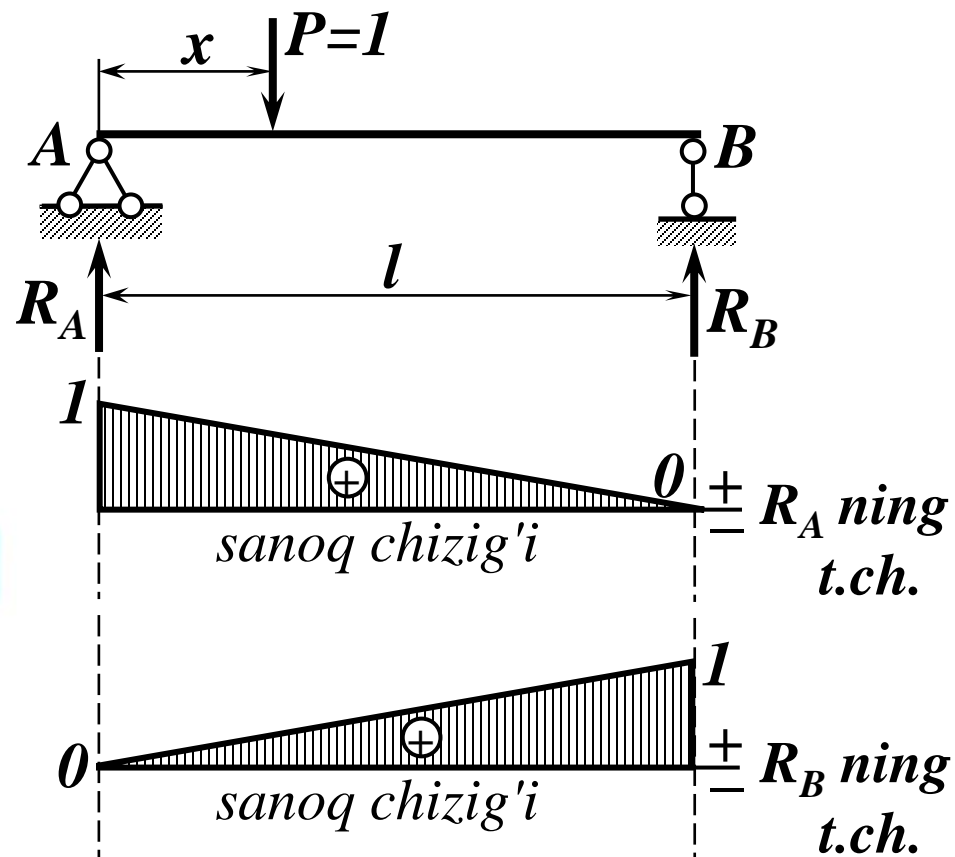
$$\sum M_A = 0; \quad -R_B \cdot \ell + P \cdot x = 0,$$

$$R_B = P \frac{x}{\ell} = \frac{x}{\ell}$$

$$0 \leq x \leq \ell$$

$X=0$ da $R_B=0$;

$X=\ell$ bo'lganda $R_B=1$ bo'ladi.



Ikki konsolli balka uchun ta'sir chiziqlar qurish

Tayanch reaksiyasining ta'sir chizig'ini qurish.

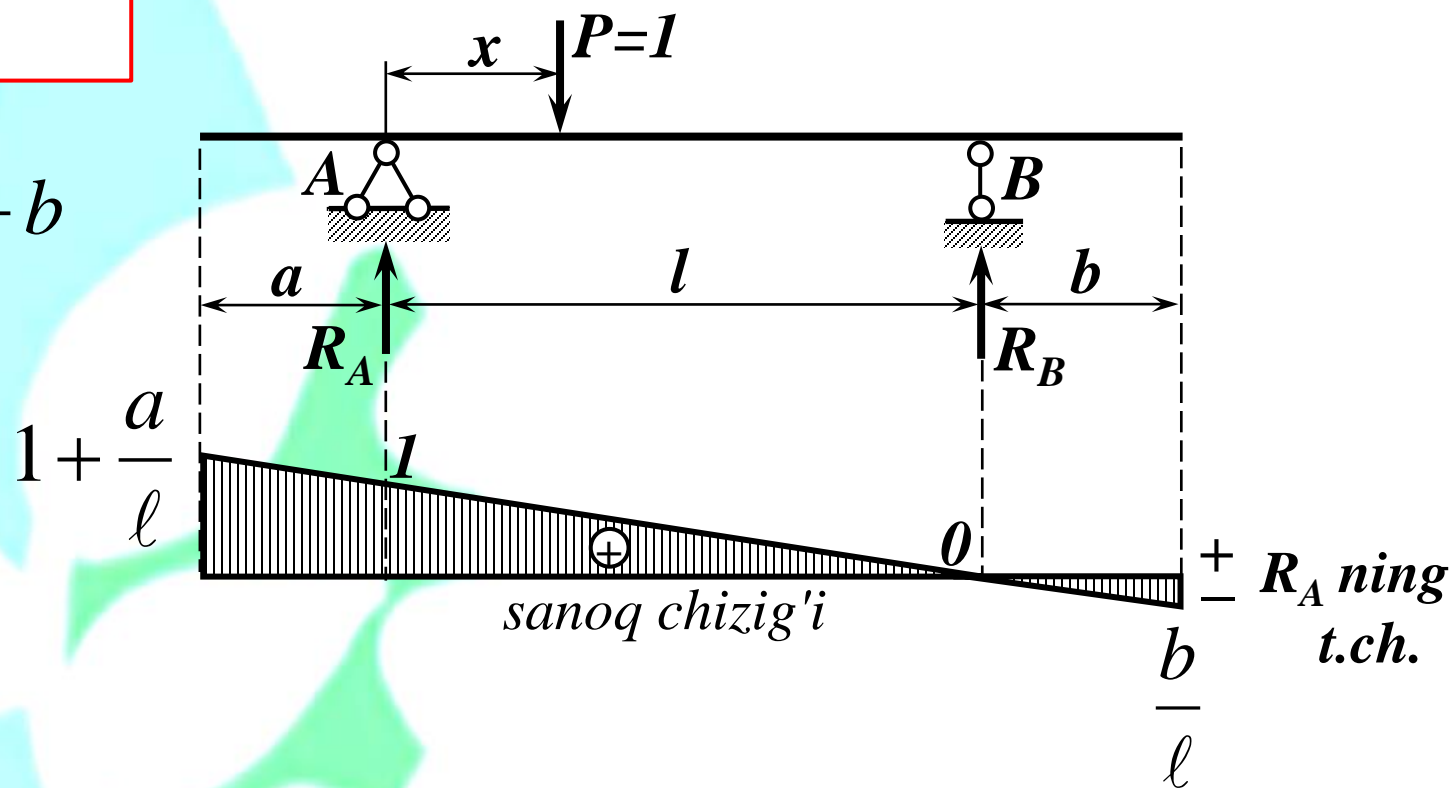
$$R_A = \frac{l-x}{l}; \quad -a \leq x \leq l+b$$

$$x=0 \quad \text{da} \quad R_A = 1,$$

$$x=l \quad \text{da} \quad R_A = 0,$$

$$x=l+b \quad \text{da} \quad R_A = -\frac{b}{l},$$

$$x=-a \quad \text{da} \quad R_A = \frac{l+a}{l} = 1 + \frac{a}{l}.$$



Ikki konsolli balka uchun ta'sir chiziqlar qurish

Tayanch reaksiyalarining ta'sir chizig'ini qurish.

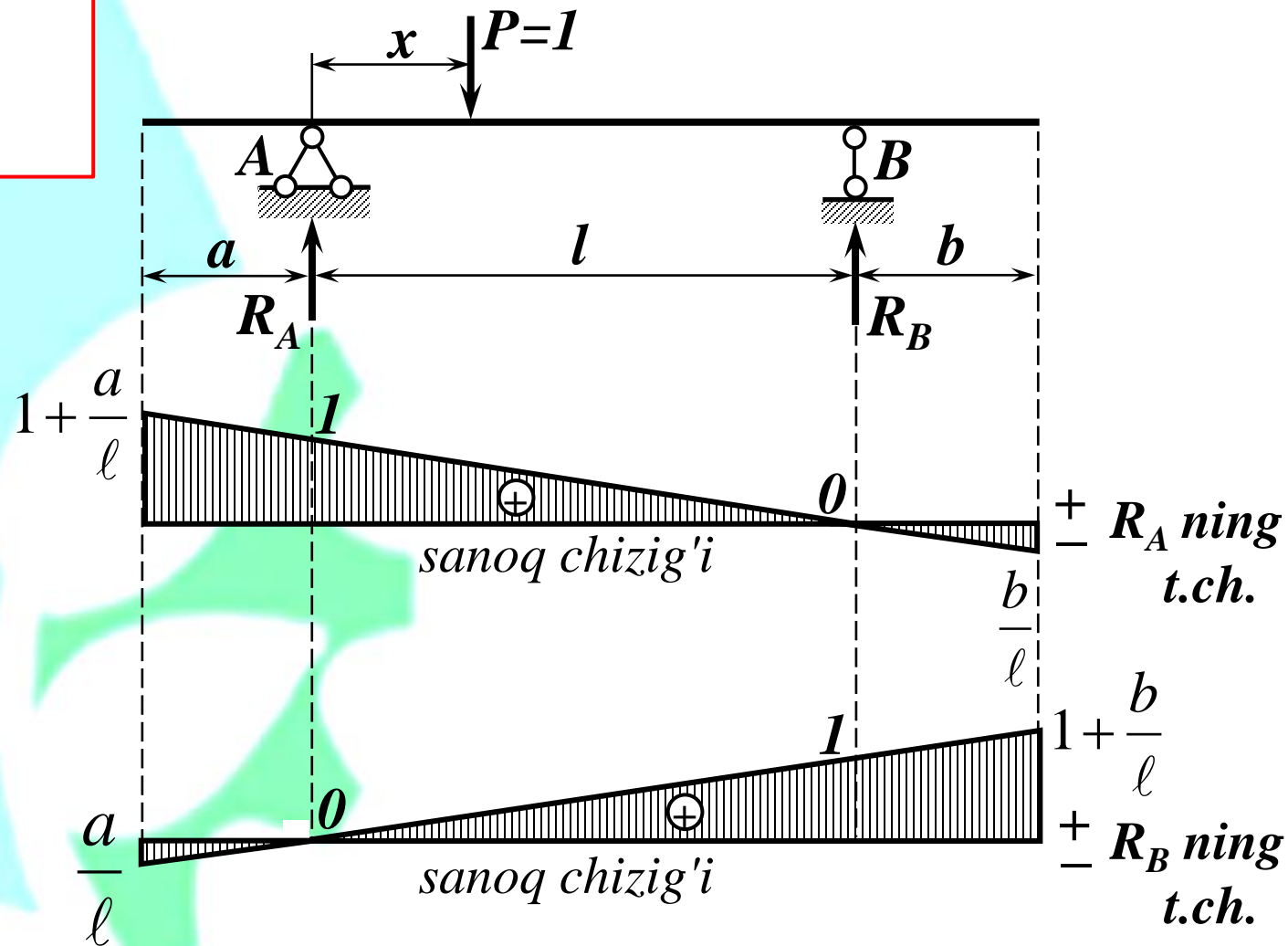
$$R_B = \frac{x}{l}; \quad -a \leq x \leq l + b$$

$$x = 0 \quad \text{da} \quad R_B = 0,$$

$$x = l \quad \text{da} \quad R_B = 1,$$

$$x = l + b \quad \text{da} \quad R_B = 1 + \frac{b}{l},$$

$$x = -a \quad \text{da} \quad R_B = -\frac{a}{l}.$$



Oddiy balka ixtiyoriy kesimi uchun ko'ndalang kuch Q ning ta'sir chizig'ini qurish

I holat $0 \leq x \leq a$

$$\sum Y = 0, \quad Q_k^{chap} = -R_B = -\frac{x}{l}$$

Agar $x = 0$ bo'lsa $Q_k^{chap} = 0$;

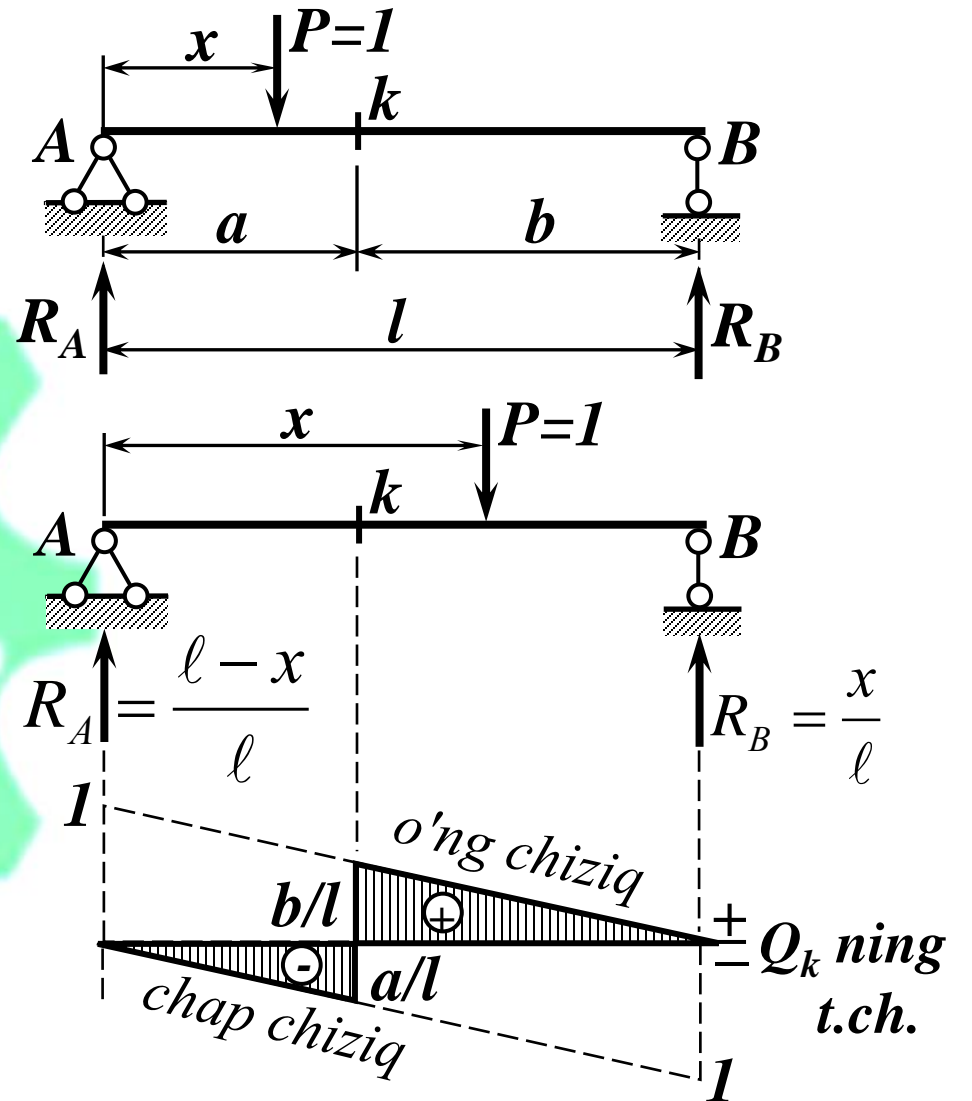
$x = a$ bo'lsa $Q_k^{chap} = -\frac{a}{l}$ bo'ladi

II holat $a \leq x \leq l$

$$\sum Y = 0, \quad Q_k^{o'ng} = R_A = \frac{l-x}{l}$$

Agar $x = a$ bo'lsa $Q_k^{o'ng} = \frac{l-a}{l} = \frac{b}{l}$;

$x = l$ bo'lsa $Q_k^{o'ng} = 0$ bo'ladi



Oddiy balka ixtiyoriy kesimi uchun ko'ndalang kuch M ning ta'sir chizig'ini qurish

I holat $0 \leq x \leq a$

$$M_k^{chap} = R_B (\ell - a) = \frac{x}{\ell} \epsilon$$

Agar $x = 0$ bo'lsa $M_k^{chap} = 0$;

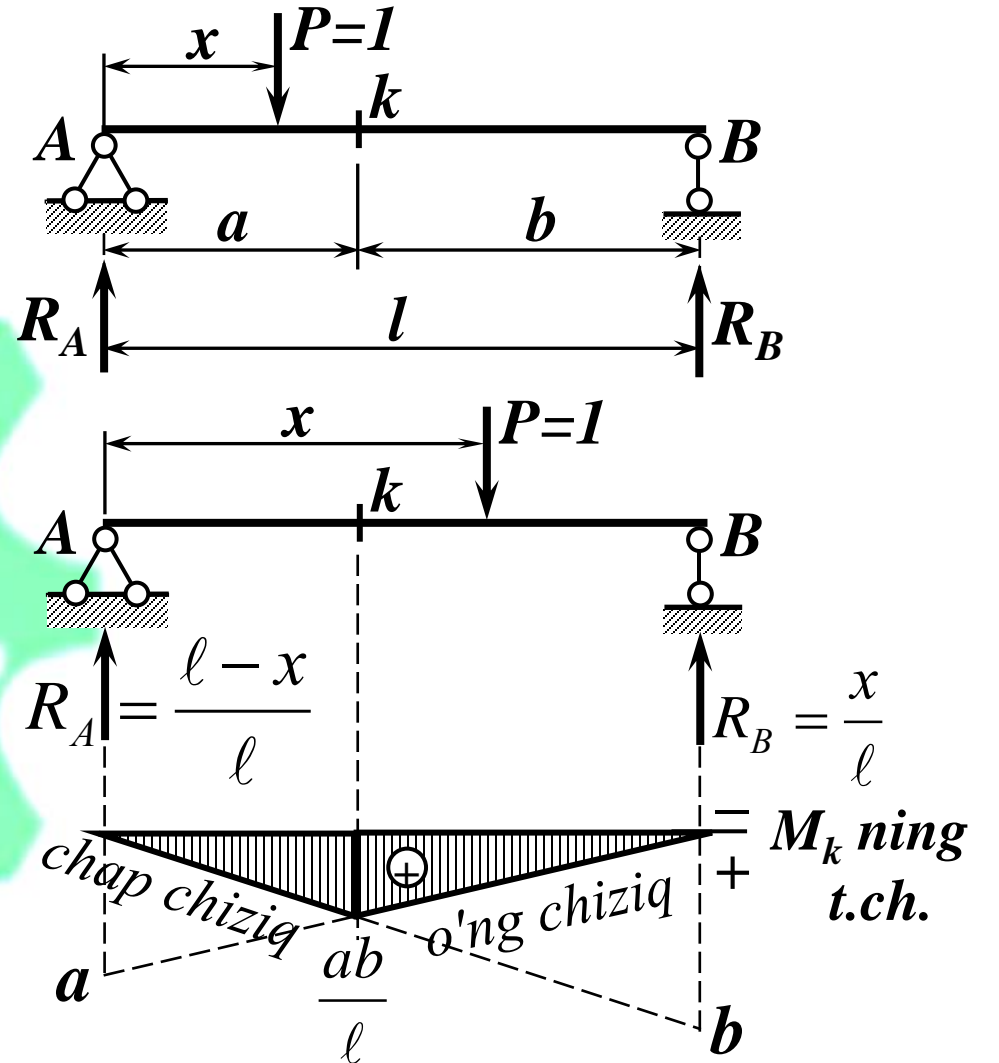
$x = a$ bo'lsa $M_k^{chap} = \frac{ab}{\ell}$ bo'ladi

II holat $a \leq x \leq \ell$

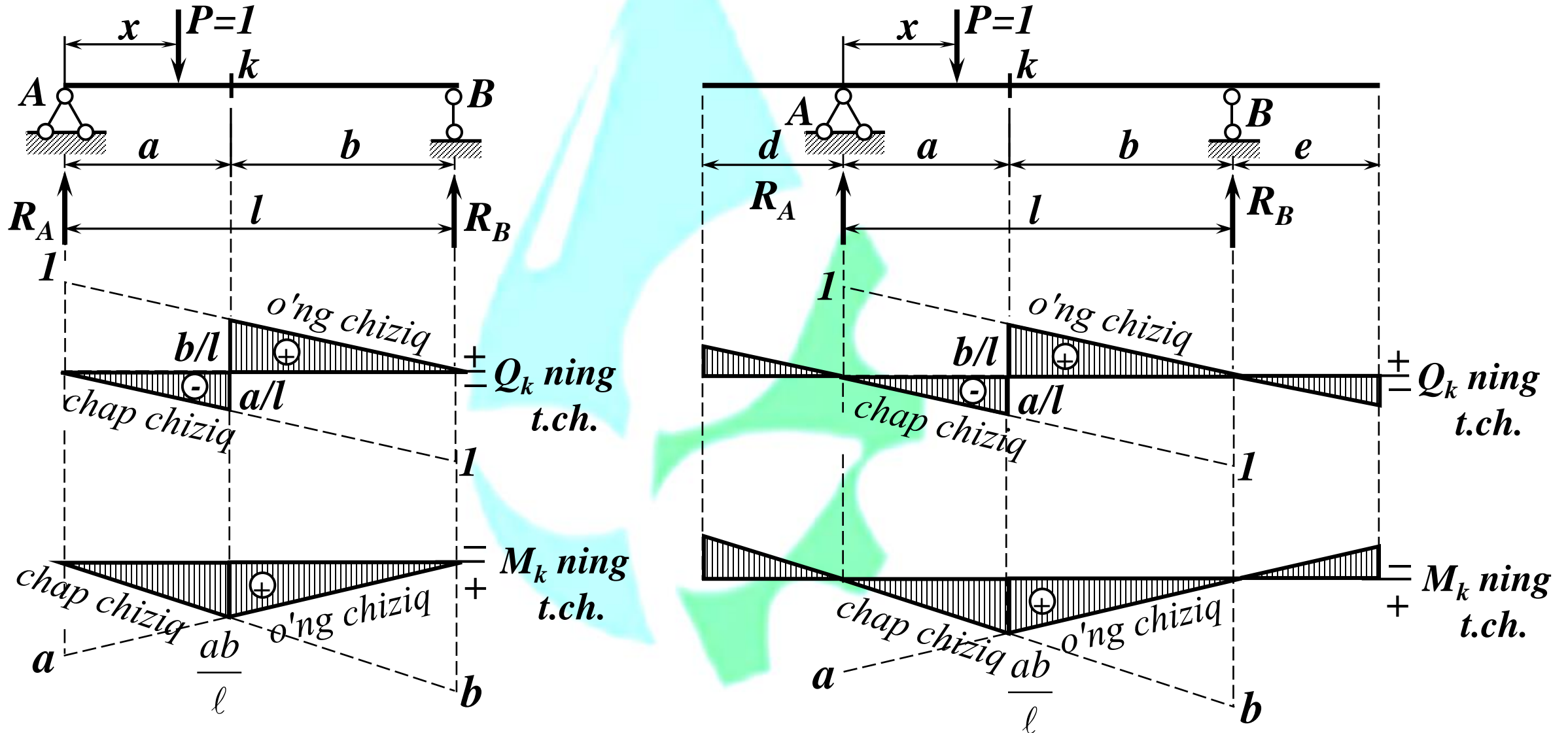
$$M_k^{o'ng} = R_A \cdot a = \frac{\ell - x}{\ell} a$$

Agar $x = a$ bo'lsa $M_k^{o'ng} = \frac{ab}{\ell}$;

$x = \ell$ bo'lsa $M_k^{o'ng} = 0$ bo'ladi



Ichki kuchlar Q va M ning ta'sir chizig'ini qurish.



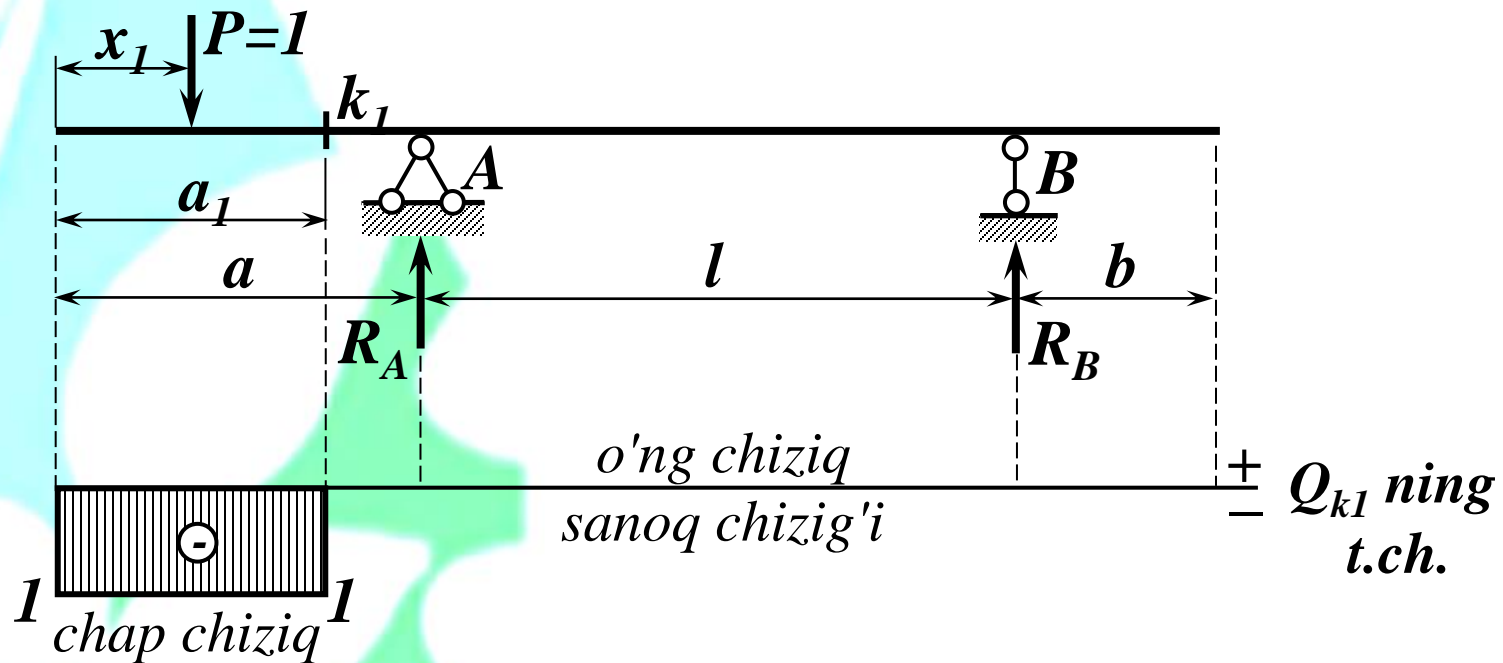
Ichki kuchlar Q va M ning ta'sir chizig'ini qurish.

$$0 \leq x_1 \leq a_1$$

$$Q_{k_1}^{chap} = -P = -1$$

$$a_1 \leq x_1 \leq (a - a_1) + l + b$$

$$Q_{k_1}^{o'ng} = 0$$



Ichki kuchlar Q va M ning ta'sir chizig'ini qurish.

$$0 \leq x_1 \leq a_1$$

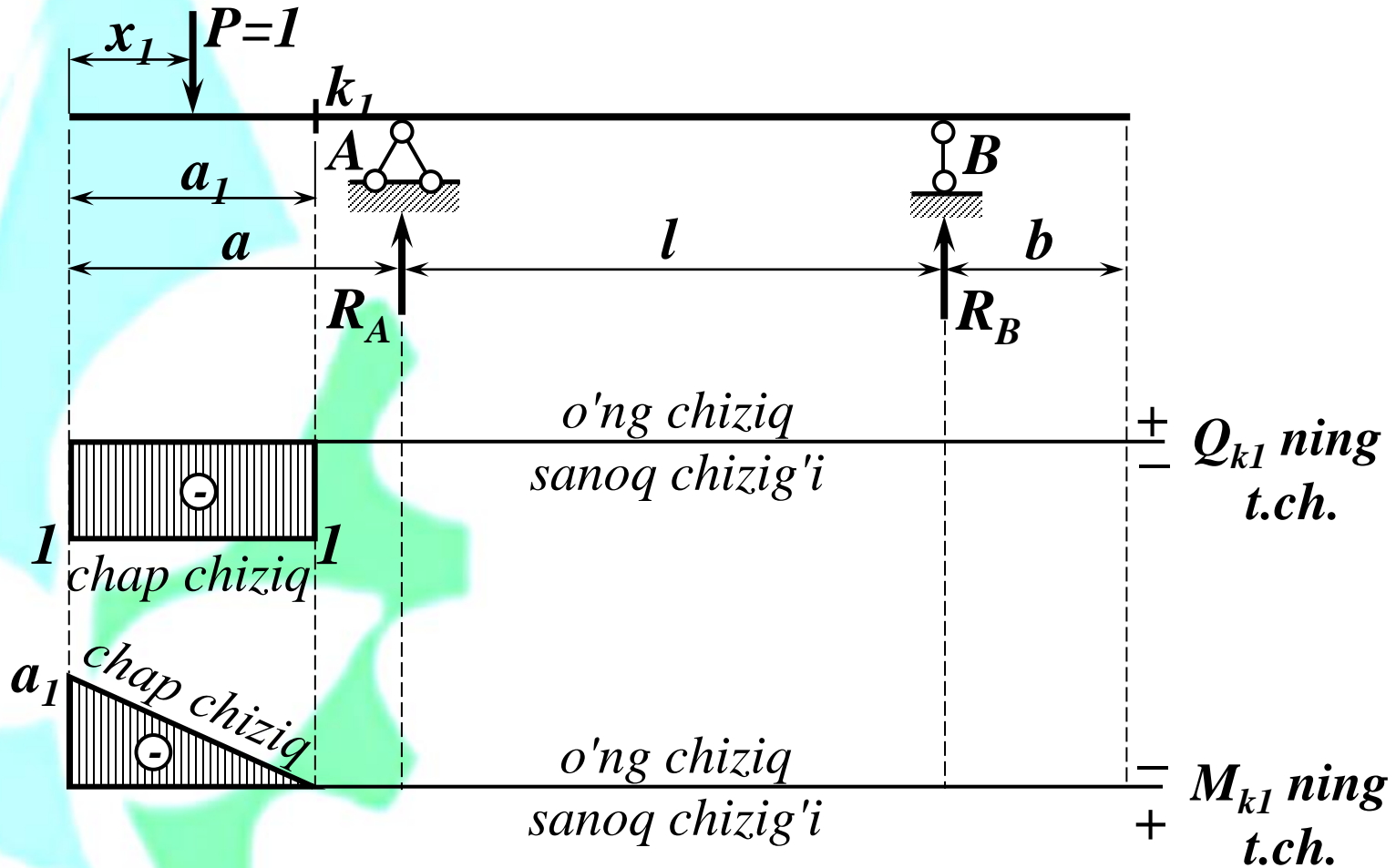
$$M_{k_1}^{chap} = -P(a_1 - x_1)$$

$$x_1 = 0 \quad da \quad M_{k_1}^{chap} = -a_1$$

$$x_1 = a_1 \quad da \quad M_{k_1}^{chap} = 0$$

$$a_1 \leq x_1 \leq (a - a_1) + l + b$$

$$M_{k_1}^{o'ng} = 0$$



Ma'ruzani mustahkamlash uchun savollar:

1. *Xarakatlanuvchi yuklar deb, qanday yuklarga aytiladi?*
2. *Ta'sir chiziqlar nazariyasi deb, nimaga aytiladi?*
3. *Ta'sir chiziqlarni chizishning statik va kinematik usullarini ayting?*
4. *Oddiy balka tayanch reaksiyalarining ta'sir chiziqlari qanday chiziladi?*
5. *Oddiy balkaning ixtiyoriy kesimida ko'ndalang kuch Q va eguvchi moment M larning ta'sir chiziqlari qanday chiziladi?*
6. *Konsol balka tayanch reaksiyalarining ta'sir chiziqlari qanday chiziladi?*
7. *Konsol balka ichki zo'riqishlarining ta'sir chiziqlari qanday chiziladi?*
8. *Ikki konsolli balka tayanch reaksiyalarining ta'sir chiziqlari qanday chiziladi?*
9. *Ikki konsolli balka zo'riqishlarining ta'sir chiziqlari qanday chiziladi?*
10. *Ikki konsolli balkaning chap yoki ung konsolidagi ichki zo'riqishlarining ta'sir chiziqlari qanday chiziladi?*



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