ODDIY FERMA STERJENLARIDA QO'ZG'ALMAS YUKLAR TA'SIRIDAN ZO'RIQISHLARNI TOPISH, ODDIY FERMA STERJENLARIDAGI ZO'RIQISHLARI UCHUN TA'SIR CHIZIQLAR QURISH VA ULARNI BERILGAN YUK BILAN YUKLASH

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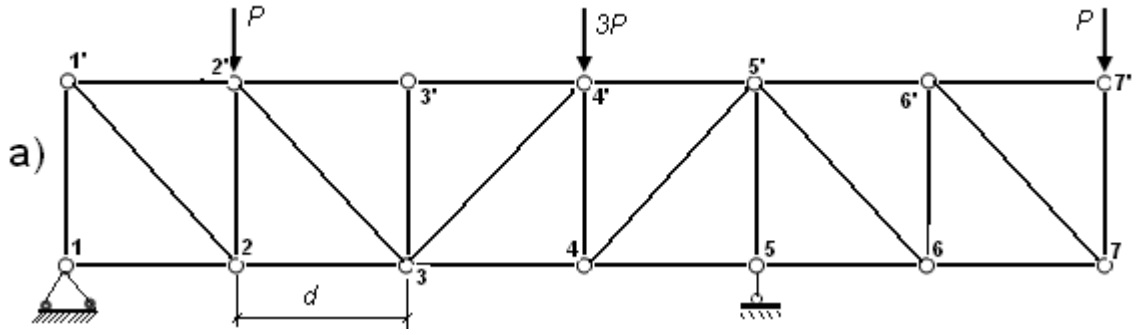
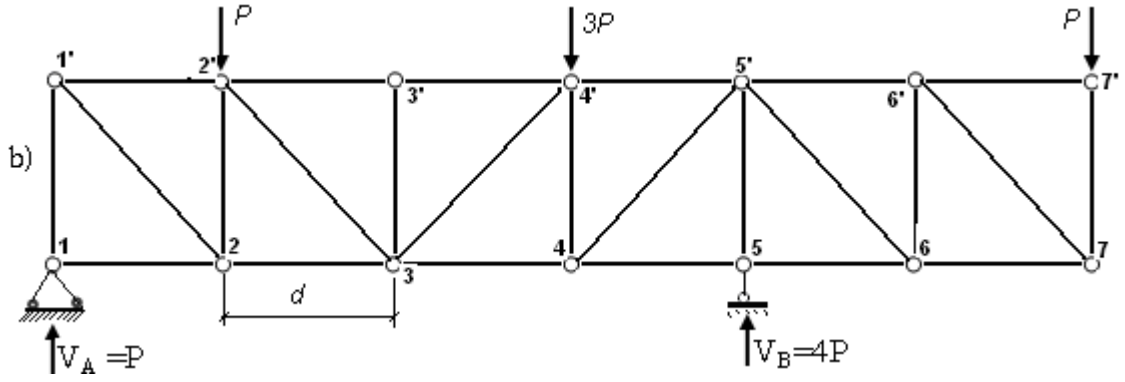
Anostatsiya: Ferma sterjenlaridagi zo'riqishlar bir nechta usullar bilan aniqladigan bo'lib, bular qo'shma kesim, sterjenlarni almashtirish va yopiq kontur usullari. Harakatlanuvchi yuk ta'sirida ham sterjenlardagi zo'riqishlar aniqlanadi.

Kalit so'zlar: Ferma, sterjenlar, zo'riqishlar, tayanch reaksiyalari, to'liq kesim usuli, moment nuqtasi, qo'shma kesim, sterjenlarni almashtirish, yopiq kontur.

a-shaklda tasvirlangan ferma sterjenlaridagi zo'riqishlar aniqlansin.



$$\ell_{1\text{–}1'} = h = \frac{4}{3}d;$$



A va B - shakl

Yechish. 1.Fermaning tayanch reaksiyalarini aniqlash.

$$\sum M_A = 0; \quad P \cdot d + 3P \cdot 3d + P \cdot 6d - V_B \cdot 4d = 0; \; V_B = \frac{16Pd}{4d} = 4P.$$

$$\sum M_B = 0; \quad P \cdot 2d - 3P \cdot d - P \cdot 3d + V_A \cdot 4d = 0; \; V_A = \frac{4Pd}{4d} = P.$$

Tekshirish: $\sum Y = 0; \quad V_A + V_B - 5P = 0; \quad P + 4P - 5P = 0; \quad \boxed{0=0.}$

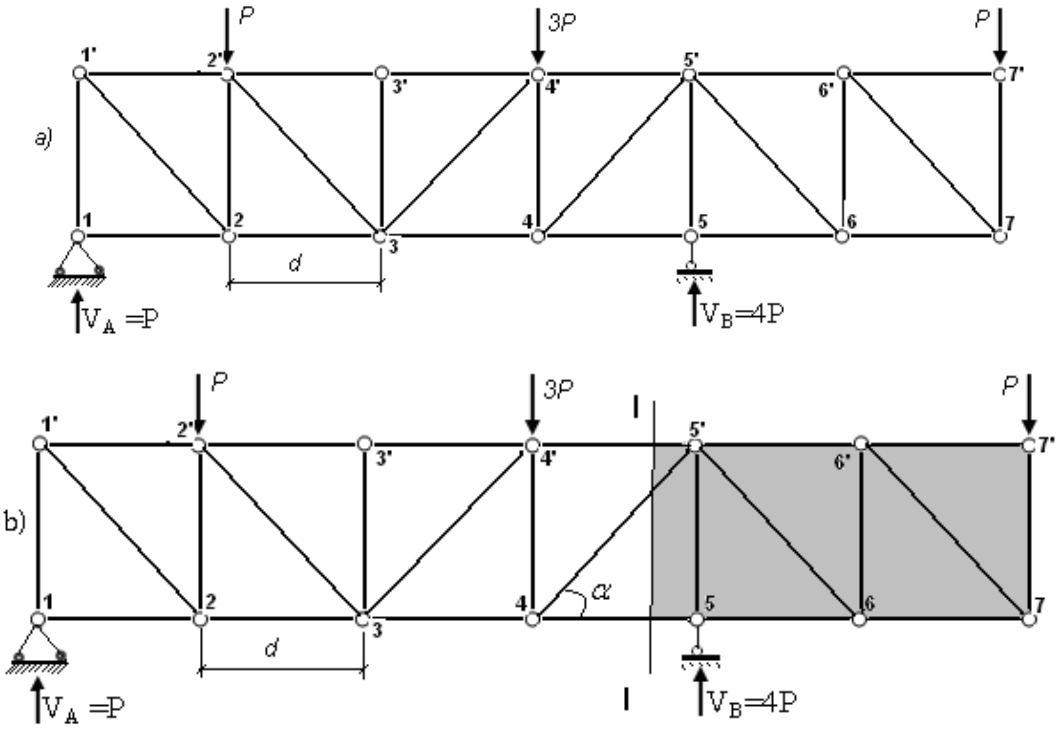
2. Ferma sterjenlaridagi zo'riqishlarni aniqlash.

To'liq kesim usuli

Agar yassi fermaning ayrim sterjenlaridagi zo'riqishlarini aniqlash talab qilinsa, u holda to'liq kesim usulidan foydalanish maqsadga muvofiqdir. Bu usulda fermaning zo'riqishi aniqlanadigan sterjenini kesib o'tuvchi biror I-I to'liq kesim bilan ferma fikran ikki qismga ajratilib, uning chap yoki o'ng qismining muvozanati tekshiriladi.

Bu yerda imkoni boricha fermaning kuchlar ko'proq ta'sir qilayotgan qismini tashlab yuborish maqsadga muvofiq hisoblanadi. Fermaning qoldirilgan qismi uchun tekislikdagi kuchlarning muvozanat tenglamalari tuziladi. Fermaning ajratilgan qismidagi noma'lum zo'riqishlarni aniqlash uchun statikaning muvozanat tenglamalaridan foydalanadi. Tenglamalar tuzishda iloji bo'lsa, har bir tenglamada noma'lumlar soni bittadan oshmasligi lozim. Bunday holda statikaning uchta tenglamasidan faqat biri - $\sum M_\kappa = 0$ ko'riladi. Moment nuqtasi sifatida kesilgan panelda qolgan ikki sterjenni kesishgan nuqtasi (K) olinadi.

2-misol. 3a-shaklda tasvirlangan fermaning $O_{4'-5'}, U_{4-5}, D_{4-5'}, V_{4-4'}$ sterjenlaridagi zo'riqishlar aniqlansin.



3-shakl

Yechish: Fermaning tayanch reaksiyalari oldingi misolda aniqlangan bo'lib, izlanayotgan sterjenlardagi zo'riqishlarni aniqlash uchun ularni ($O_{4'-5'}, U_{4-5}, D_{4-5'}$) qirqib o'tuvchi I-I kesim o'tkaziladi (6.3, b-shakl) va fermaning o'ng (chap) qismini ajratib ko'riladi.

$O_{4'-5'}$ sterjendagi zo'riqishni aniqlashda moment nuqtasi sifatida 4-nuqta olinadi:

$$\sum M_4^{o'ng} = 0;\ P \cdot 3d - V_B \cdot d - O_{4'-5'} h = 0;$$

$$O_{4'-5'} = \frac{-V_B \cdot d + P \cdot 3d}{h} = \frac{-4Pd + 3Pd}{\frac{4}{3}d} = \frac{-P \cdot 3}{4} = -0.75P;$$

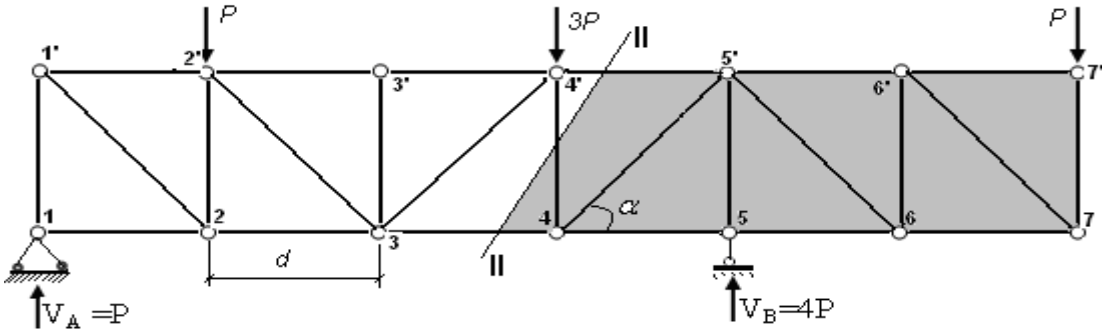
U_{4-5} sterjendagi zo'riqishni aniqlashda moment nuqtasi sifatida 5'-nuqta olinadi: $\sum M_{5'}^{o'ng} = 0;$

$$P \cdot 2d - V_B \cdot 0 + U_{4-5} h = 0;\ U_{4-5} = -\frac{2Pd}{h} = -\frac{2Pd}{4d/3} = -\frac{6P}{4} = -1.5P;$$

$D_{4-5'}$ sterjendagi zo'riqishni aniqlashda $\sum Y = 0$ shartidan foydalanamiz: $\sum Y^{o'ng} = 0;$

$$V_B - P - D_{4-5'} \sin\alpha = 0;\ D_{4-5'} = \frac{V_B - P}{\sin\alpha} = \frac{4P - P}{0.8} = 3{,}75P.$$

$V_{4-4'}$ sterjendagi zo'riqishni aniqlash uchun shu sterjenni qirqib o'tuvchi II-II kesim o'tkaziladi (6.4-shakl) va fermaning o'ng (chap) qismi ajratib ko'riladi.



4-shakl

$$\sum Y^{o'ng} = 0;\ V_{4-4'} + V_B - P = 0;\ V_{4-4'} = -V_B + P = -4P + P = -3P.$$

Agar ferma sterjenlaridagi zo'riqishlarni yuqorida ko'rilgan usullar bilan aniqlash imkoniyati bo'lmasa, u holda ularni boshqa usullar bilan aniqlash kerak bo'ladi. Mazkur uslubiy ko'rsatmaning hajmi cheklanganligi sababli hamma usullar keltirilmadi, zarurat paydo bo'lganda **qo'shma kesim**, **sterjenlarni almashtirish** va **yopiq kontur** usullari bilan qurilish mexanikasi adabiyotlari orqali tanishib chiqish mumkin.

R=1 xarakatlanuvchi yuk ta'siridan ferma sterjenlari zo'riqishlarining ta'sir chiziqlarini quramiz.

Avval A va V tayanch rektsiyalarining ta'sir chiziqlarini statik usulda qurib olamiz (a va b shakl).

S_{14} -sterjeni zo'riqishining ta'sir chizig'i.

R=1 kuchi *I-I* kesimdan o'ngda, chap tomonning muvozanatini qaraymiz.

2-nuqta moment nuqtasi:

$$\sum M_2^{чап} = 0; \quad -S_{14}h_{12} + R_A d = 0:$$

$$S_{14} = \frac{d}{h_{12}} R_A = \frac{4}{5} R_A = 0.8R_A$$

Demak S_{14} sterjeni zo'riqishining ta'sir chizig'i chap tarmog'ini hosil qilish uchun, R_A a'sir chizig'i ordinatalarini 0.8 ga ko'paytirish kerak ekan.

Demak S_{14} terjeni zo'riqishining ta'sir chizig'i o'ng tarmog'ini hosil qilish uchun, R_B ta'sir chizig'i ordinatalarini 2.4 ga ko'paytirish kerak ekan. O'ng va chap tarmoq chiziqlari 2- nuqta ostida kesishadi (s-shakl).

S_{23} -sterjeni zo'riqishining ta'sir chizig'i.

1-xolat: R=1 kuchi *I-I* kesimdan o'ngda, chap tomonning muvozanatini qaraymiz. 4-nuqta moment nuqtasi:

$$\sum M_4^{чап} = 0; \quad S_{23}h_1 + R_A 2d = 0:$$

$$S_{23} = -\frac{2d}{h_1} R_A = -\frac{2 \cdot 4}{5.82} R_A = -1.375R_A$$

Demak S_{14} sterjeni zo'riqishining ta'sir chizig'i chap tarmog'ini hosil qilish uchun, R_A ta'sir chizig'i ordinatalarini -1.375 ga ko'paytirish kerak ekan.

2-xolat: R=1 kuchi *I-I* kesimdan chapda, o'ng tomonning muvozanatini qaraymiz. 4-nuqta moment nuqtasi:

$$\sum M_4^{ўнг} = 0; \quad -S_{23}h_1 - R_B 2d = 0:$$

$$S_{23} = -\frac{2d}{h_{12}} R_B = -\frac{2 \cdot 4}{5.82} R_B = -1.375R_B$$

Demak S_{23} sterjeni zo'riqishining ta'sir chizig'i o'ng tarmog'ini hosil qilish uchun, R_B ta'sir chizig'i ordinatalarini -1.375 ga ko'paytirish kerak ekan. O'ng va chap tarmoq chiziqlari 4- nuqta ostida kesishadi (d-shakl).

S_{24} -sterjeni zo'riqishining ta'sir chizig'i.

1-xolat: R=1 kuchi *I-I* kesimdan o'ngda, chap tomonning muvozanatini qaraymiz. *k*-nuqta moment nuqtasi:

$$\sum M_k^{чап} = 0; \quad S_{24}h_2 - R_A(a+d) = 0:$$

$$S_{24} = \frac{(a+d)}{h_2} R_A = \frac{(4+12)}{18.74} R_A = 0.854\,R_A$$

Demak S_{24} sterjeni zo‘riqishining ta’sir chizig‘i chap tarmog‘ini hosil qilish uchun, R_A ta’sir chizig‘i ordinatalarini 0,854 ga ko‘paytirish kerak ekan.

2-xolat: R=1 kuchi *I-I* kesimdan chapda, o‘ng tomonning muvozanatini qaraymiz. 4-nuqta moment nuqtasi:

$$\sum M_k^{\text{ўнг}} = 0; \quad -S_{24}h_2 - R_B(a+6d) = 0:$$

$$S_{24} = -\frac{(a+6d)}{h_2} R_B = -\frac{36}{18.74} R_B = -1.921 R_B$$

Demak S_{23} sterjeni zo‘riqishining ta’sir chizig‘i o‘ng tarmog‘ini hosil qilish uchun, R_B ta’sir chizig‘i ordinatalarini -1.921 ga ko‘paytirish kerak ekan. O‘ng va chap tarmoq chiziqlari k- nuqta ostida kesishadi. O‘ng va chap tarmoq chiziqlarini 2-va 4-tugunlarga proeksiyalab uzatish chizig‘i orqali birlashtiramiz (e-shakl).

S_{12} -sterjeni zo‘riqishining ta’sir chizig‘ini qurish uchun II-II kesimini o‘tkazib 1-tugun muvozanatini qaraymiz. R=1 kuchi tugunda (j-shakl).

$$\sum Y = 0 \; ; \; S_{12} = P = 1$$

Demak R=1 kuchi tugunda bo‘lganida zo‘riqish 1 ga teng bo‘lib, tugundan A nuqta yoki 4- nuqtaga xarakatlangan sari zo‘riqish kamayadi va shu tugunlarga yetganda S_{12} sterjenida zo‘riqish nolga teng bo‘ladi (z-shakl).

Ta’sir chiziqlaridan foydalanib doimiy kuchlardan zo‘riqishlarni aniqlaymiz.

$$R_A = P(y_1 + 1 + y_2 + y_3 + y_4 - y_5) = 10(1.25 + 1 + 0.75 + 0.50 + 0.25 - 0.25) = 35kN$$

$$R_B = P(-y_1 + y_2 + y_3 + y_4 + 1 + y_5) = 10(-0.25 + 0.25 + 0.50 + 0.75 + 1 + 1.25) = 35kN$$

$$S_{14} = P(-y_1 + y_2 + y_3 + y_4 - y_5) = 10(-0.6 + 0.6 + 0.4 + 0.2 - 0.2) = 4kN$$

$$S_{23} = P(y_1 - y_2 - y_3 - y_4 + y_5) = 10(0.344 - 0.344 - 0.688 - 0.344 + 0.344) = -6.88kN$$

$$S_{24} = P(y_1 - y_2 + y_3 + y_4 - y_5) = 10(0.48 - 0.48 + 0.427 + 0.214 - 0.214) = 4.27kN$$

$S_{12} = P \cdot 1 = 10kN$ (Xarakatlanuvchi yuk ostki belboq bo‘ylab xarakatlanganida)

$S_{12} = P \cdot 1 = 0 \cdot 1 = 0$ (Xarakatlanuvchi yuk ustki belboq bo‘ylab xarakatlanganida)

Foydalanilgan adabiyotlar:

1. Пирназаров Г. Ф., угли Озоджонов Ж. Т. НО КОНСЕРВАТИВ КУЧЛАР БИЛАН ЮКЛАНГАНДА СТЕРЖЕНЛАРНИНГ БАРҚАРОРЛИГИ ҲАҚИДА //AGROBIOTEXNOLOGIYA VA VETERINARIYA TIBBIYOTI ILMIY JURNALI. – 2022. – Т. 2. – С. 7-12.
2. Ilhom o‘g‘li, M. E. (2022). KO ‘P PROLYOTLI SHARNERLI BALKALARNI XARAKATLANUVCHI YUK TA’SIRIGA HISOBLASH. In *" ONLINE-CONFERENCES" PLATFORM* (pp. 250-254).
3. Shohjaxon Maxamadro‘zi o‘g, U., & Ilhom o‘g‘li, M. E. (2022). TEMIR YO ‘L TRANSPORTIDA BINO VA INSHOOTLAR QURILISHI. In " ONLINE-CONFERENCES" PLATFORM (pp. 234-237).
4. Mustafoyev Eldor Ilhom o'g'li - " ONLINE-CONFERENCES" PLATFORM, 2022
5. Pirnazarov, G. F., Mamurova, F. I., & Mamurova, D. I. (2022). Calculation of Flat Ram by the Method of Displacement. EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION, 2(4), 35-39.
6. Mamurova, F. I., Khodzhaeva, N. S., & Kadirova, E. V. (2023). Pedagogy of Technology and its University. Innovative Science in Modern Research, 22-24.
7. Mamurova, F. I. (2021). PROBLEMS OF THEORETICAL STUDY OF PROFESSIONAL COMPETENCE OF CONSTRUCTION ENGINEERS. Таълим ва инновацион тадқиқотлар, (4), 104-108.
8. Odilbekovich, S. K., & Islomovna, M. F. (2023). Technology of Work on the Replacement of Contaminated Ballast below the Sole of Sleepers. New Scientific Trends and Challenges, 1, 21-24.
9. MAMUROVA, FERUZA ISLOMOVNA. "FACTORS OF FORMATION OF PROFESSIONAL COMPETENCE IN THE CONTEXT OF INFORMATION EDUCATION." THEORETICAL & APPLIED SCIENCE Учредители: Теоретическая и прикладная наука 9 (2021): 538-541.
10. Islomovna, M. F., Islom, M., & Absolomovich, K. X. (2023). Projections of a Straight Line, the Actual Size of the Segment and the Angles of its Inclination to the Planes of Projections. Miasto Przyszłości, 31, 140-143.
11. Islomovna, M. F. (2022). Success in Mastering the Subjects of Future Professional Competence. EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION, 2(5), 224-226.
12. Shaumarov, S., Kandakhorov, S., & Mamurova, F. (2022, June). Optimization of the effect of absolute humidity on the thermal properties of non-autoclaved aerated concrete based on industrial waste. In AIP Conference Proceedings (Vol. 2432, No. 1, p. 030086). AIP Publishing LLC.
13. Mamurova, F. I. (2021). The Concept of Education in the Training of Future Engineers. International Journal on Orange Technologies, 3(3), 140-142.
14. Islomovna, M. F. (2023). Engineering Computer Graphics Drawing Up and Reading Plot Drawings. New Scientific Trends and Challenges, 120-122.

15. Raximov, S. D., and S. S. Sodiqov. "TEXNIK SOHA MUTAXASSISLARI O ‘QUV FANLARINI O ‘QITISH TAYYORGARLIK JARAYONIDA C++ DASTURIDAN FOYDALANISH ZARURATI." INTERNATIONAL CONFERENCE: PROBLEMS AND SCIENTIFIC SOLUTIONS.. Vol. 1. No. 7. 2022.
16. Khodjayeva, N., & Sodikov, S. (2023). Methods and Advantages of Using Cloud Technologies in Practical Lessons. Pioneer: Journal of Advanced Research and Scientific Progress, 2(3), 77-82.
17. Islomovna, M. F., Islom, M., & Absolomovich, K. X. (2023). Projections of a Straight Line, the Actual Size of the Segment and the Angles of its Inclination to the Planes of Projections. Miasto Przyszłości, 31, 140-143.
18. Mamurova, F. I. (2022, December). IMPROVING THE PROFESSIONAL COMPETENCE OF FUTURE ENGINEERS AND BUILDERS. In INTERNATIONAL SCIENTIFIC CONFERENCE" INNOVATIVE TRENDS IN SCIENCE, PRACTICE AND EDUCATION" (Vol. 1, No. 4, pp. 97-101).
19. Islomovna, M. F. (2022). Success in Mastering the Subjects of Future Professional Competence. EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION, 2(5), 224-226.
20. Muxitdinovna, A. Z. (2022). Mantessori Preschool Organizations. *American Journal of Social and Humanitarian Research*, *3*(1), 373-377.
21. To’raqulovich J. U., Muxitdinovna A. Z. Features of Speech Development in Children of Middle Preschool Age.
22. Ashurova Z. Scientific prodress: Muammoli ta'lim texnologiyalari, ularning o'ziga xos xususiyatlari //Buxoro davlat universitetining Pedagogika instituti jurnali. – 2021. – Т. 1. – №. 1.
23. Abdullayev S. S., Hamroyev J. B. Features of the Organization of Pedagogical Practice. – 2023.