

O'ZBEKISTON RESPUBLIKASI
OLIY VA O'RTA MAXSUS TA'LIM VAZIRLIGI

NAMANGAN MUXANDISLIK - PEDAGOGIKA INSTITUTI

«Materiallar qarshiligi va mexanika» kafedrası

«NAZARIY MEXANIKA»
fanidan hisob-grafik ishlarini bajarish uchun

USLUBIY KO'RSATMA

Mavzu: Qattiq jismning tayanch reaksiya kuchlarini aniqlash.
S-1 topshiriq



NAMANGAN- 2016

Ushbu uslubiy ko`rsatma “Nazariy mexanika” fanidan 5140900-Kasb ta`limi “Transport vositalarini ishlatish va ta`mirlash”, “Qishloq xo`jaligini mexanizatsiyalashtirish” xamda 5140900- Kasb ta`limi “Elektroenergetika” va boshqa barcha bakalavr yo`nalishlari uchun foydalanishga mo`ljallangan.

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Uslubiy ko`rsatma “Materiallar qarshiligi va urilish mexanikasi” kafedrasining umumiy yig`ilishida muhokama qilingan.

Bayon: _____

2016 yil.

Ushbu uslubiy ko`rsatma institut o`uv uslubiy kengashining _____

Sonli yig`ilishida ko`rib chiqilgan va chop etishga tavsiya etilgan _____

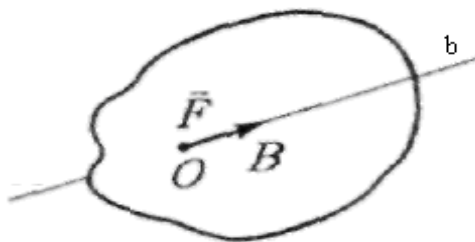
Mavzu: Qattiq jismning tayanch reaksiya kuchlarini aniqlash.

Reja:

1. Kuch. Kuchning o'qdagi proeksiyasi. Kuchning o'qdagi proeksiyalari orqali ifodalash.
2. Kuchning nuqtaga nisbatan momenti.
Teng ta'sir etuvchining momenti to'g'risida Varin'on teoremasi.
3. Bog'lanish turlari va bog'lanish reaksiyalari.
4. Tekislikda ixtiyoriy joylashgan kuchlar sistemasining muvozanat shartlari.

1. Kuch.

Ta'rif: Jismlarning o'zaro mexanik ta'sirlarini miqdor va yo'nalish jihatdan xarakterlovchi kattalikka kuch deyiladi. Kuchning jismga ta'siri quyidagi uchta omil bilan belgilanadi: son qiymati, yo'nalishi va qo'yilish nuqtasi.



1-rasm

Kuch vektori yotgan to'g'ri chiziq kuchning ta'sir chizig'i deyiladi. Kuch vektori $\vec{F}$, miqdor F bilan belgilanadi. Kuchning (SI) sistemasida o'lchov birligi qilib Nyuton qabul qilingan $1 \text{ kN} = 10^3 \text{ N}$.

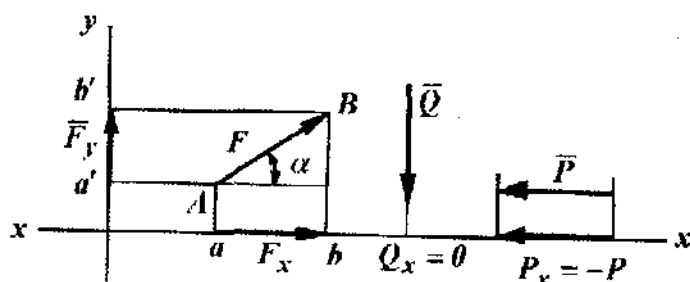
1.1. Kuchning o'qdagi proeksiyasi

Kuchning o'qdagi proeksiyasi deb, kuch vektorining boshi va oxiridan o'qqa tushirilgan ikkita perpendikulyar orasidagi o'q kesmasiga aytiladi.

Kuch bilan o'q bir tekislikda yotgan bo'lsa, $\vec{F}$ kuchning Ox o'qdagi proeksiyasini aniqlash uchun kuchning boshi A va uchi Ox o'qqa perpendikulyar (Aa), (Bb) punktir chiziqlarni o'tkazamiz. U holda ab kesma $\vec{F}$ kuchning Ox o'qdagi proeksiyasini ifodalaydi.

$$F_x = F \cos \alpha; \quad F_y = F \sin \alpha \quad F = \sqrt{F_x^2 + F_y^2}$$

bunda α - F kuchning OX o'qi musbat yo'nalishi bilan tashkil etgan burchagi



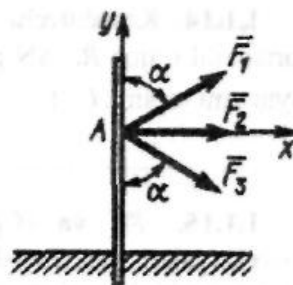
2-rasm

Agar α burchak o'tkir bo'lsa ($\alpha < 90^\circ$) kuchning o'qdagi proektsiyasi musbat, o'tmas bo'lsa ($\alpha > 90^\circ$) manfiy bo'ladi. Demak, kuchning biror o'qdagi proektsiyasi skalyar miqdor bo'lib, kuch moduli bilan kuchning shu o'q musbat yo'nalishi bilan tashkil qilgan burchak kosinusiga ko'paytmasiga teng.

Mavzuga doir masala namunasi.

1 -MASALA.

Vertikal sim yog'ochning A nuqtasiga uchta kuch ta'sir etadi: $F_1=F_2=F_3=10\text{N}$. Agar bu kuchlar bir tekislikda joylashgan bo'lib, F_1 va F_3 kuchlar gorizontal Ax o'qqa $\alpha = 60^\circ$ burchak ostida qo'yilgan bo'lsa, bu kuchlar yig'indisining gorizontal tashkil etuvchisini toping?



3-rasm

Yechish: Masalani yechish uchun, ya'ni berilgan kuchlarni A_x - o'qdagi proektsiyalarini yig'indisini aniqlash uchun, har bir kuchning shu o'qdagi proektsiyasini topamiz va ularni algebraik qo'shamiz. Shakldan ko'rinib turibdiki;

$$F_{1x} = F_1 \cdot \cos(90^\circ - \alpha) = F_1 \cdot \sin \alpha;$$

$$F_{2x} = F; \quad F_{3x} = F_3 \cdot \cos(90^\circ - \alpha) = F_3 \cdot \sin \alpha$$

$$F_{1x} + F_{2x} + F_{3x} = F_1 \cdot \sin \alpha + F_2 + F_3 \cdot \sin \alpha = 10(2 \sin 60^\circ + 1) = 10(1.73 + 1) = 10 \cdot 2.73 = 27.3 \text{ N}$$

2 - MASALA.

Qattiq jismning O nuqtasiga 4 ta kuch ta'sir etadi: $F_1=1\text{N}$; $F_2=2\text{N}$; $F_3=3\text{N}$; $F_4=4\text{N}$. Agar bu kuchlarning Ox va Oy o'qlarga

nisbatan $\alpha = 30^\circ$; $\beta = 45^\circ$; $\gamma = 60^\circ$

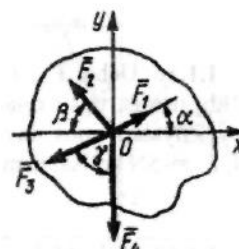
burchaklar ostida

joylashishi berilgan bo'lsa, kuchlar

yig'indisining Oy o'qiga nisbatan

proyektsiyasini

toping?



4-rasm

Yechish: Bu masalada berilgan barcha kuchlarni oy – o'qdagi proektsiyasini aniqlab olamiz.

$$F_{1y} = F_1 \cdot \cos(90^\circ - \alpha) = F_1 \cdot \sin \alpha$$

$$F_{2y} = F_2 \cdot \cos(90^\circ - \beta) = F_2 \cdot \sin \beta$$

$$F_{3y} = F_3 \cdot \cos(180^\circ - \gamma) = -F_3 \cdot \cos \gamma$$

$$F_{4y} = F_4 \cdot \cos 180^\circ = -F_4$$

Ularni algebraik yig'indisini topamiz

$$F_{1y} + F_{2y} + F_{3y} + F_{4y} = F_1 \sin \alpha + F_2 \sin \beta - F_3 \cos \gamma - F_4 = 1 \sin 30^\circ + 2 \sin 45^\circ - 3 \cos 60^\circ - 4 = \\ = 0.5 + 1.41 - 1.5 - 4 = -3.58 \text{ N}$$

3- MASALA.

Tekislikda joylashgan $\vec{F}_1 = 3\vec{i} + 4\vec{j}$ $\vec{F}_1 = 5\vec{j}$ ba $\vec{F}_1 = 2\vec{i}$ kesishuvchi kuchlar sistemasi uchun teng ta'sir etuvchining qiymatini hisoblang.

Yechish: $\vec{F}_1 = 3\vec{i} + 4\vec{j}$ $\vec{F}_1 = 5\vec{j}$ ba $\vec{F}_1 = 2\vec{i}$, $R=?$ $R = \sqrt{R_x^2 + R_y^2}$ berilishiga ko'ra quyidagicha yozish mumkin. $F_{1x} = 3$ $F_{2x} = 0$ $F_{3x} = 2$ $F_{1y} = 4$ $F_{2y} = 5$ $F_{3y} = 0$

Demak, $R_{1x} = F_{1x} + F_{2x} + F_{3x} = 3 + 0 + 2 = 5 \text{ N}$ $R_{1y} = F_{1y} + F_{2y} + F_{3y} = 4 + 5 + 0 = 9 \text{ N}$

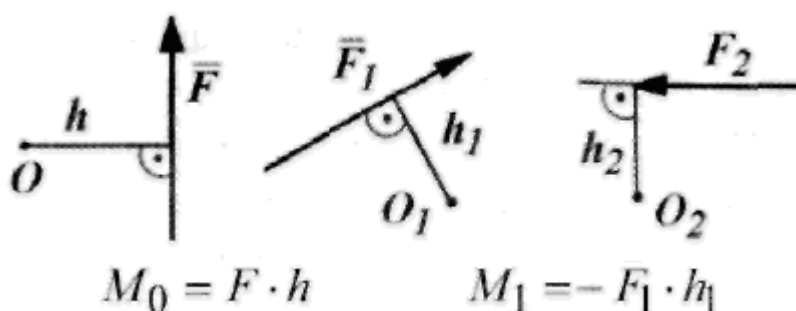
$$R = \sqrt{R_x^2 + R_y^2} = \sqrt{5^2 + 9^2} = 8,6 \text{ N}$$

2. Kuchning nuqtaga nisbatan momenti

Kuch ta'sirida jism ilgarilanma harakatda, biror nuqta yoki o'q atrofida aylanma harakatda bo'lishi mumkin. Mexanikada jismni aylantiruvchi kuchning ta'siri kuch momenti deb ataladigan kattalik bilan o'lchanadi.

Qattiq jism O nuqta atrofida $\vec{F}$ kuch ta'sirida erkin aylanma harakat qilsin. Jismni O nuqta atrofida tez yoki sekin aylanishi kuchning qiymati va yelkasiga bog'liq. Kuchning aylantiruvchi ta'siri kuch momenti bilan xarakterlanadi. Kuchning nuqtaga nisbatan momenti tushunchasini Leonardo da Vinchi (1452-1519) kiritdi.

Kuchning nuqtaga nisbatan momenti deb, kuch modulini uning yelkasiga ko'paytmasiga aytiladi.



Kuch momenti qaysi nuqtaga nisbatan olinsa, shu nuqta moment markazi deb ataladi. Moment markazidan kuchning ta'sir chizig'igacha bo'lgan eng qisqa oraliq kuchning yelkasi deyiladi. Bunda h - kuchning O nuqtaga nisbatan yelkasi. Kuch momentining birligi - nyuton metr (Nm).

Kuch moment markazi atrofida jismni soat stryelkasining harakat yo'nalishiga teskari tomonga aylantirishga intilganda, kuch momentini musbat va aksincha, teskari yo'nalishda manfiy ishorali deb olinadi.

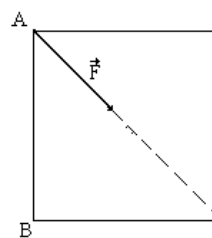
Kuchning miqdori va yo'nalishini ozgartirmay ta'sir chizig'i bo'ylab istalgan nuqtaga ko'chirilsa, kuch momenti o'zgarmaydi.

Agar kuchning ta'sir chizig'i moment markazidan o'tsa, uning shu markazga nisbatan momenti nolga teng bo'iadi, chunki bu holda kuchning yelkasi nolga teng.

Mavzuga doir masala namunasi.

4- MASALA.

Kvadrat plastinaning A nuqtasiga $F=150N$ kuch ta'sir etadi. Agar kvadratning tomonlari $0,2m$ bo'lsa, kuchning B nuqtaga nisbatan momentini toping?



5-rasm

Berilgan: $a = 0,2m$ $F = 150N$. $mom_A(\vec{F}) = ?$

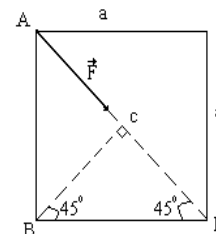
Ta'rifga ko'ra $\vec{F}$ kuchidan B nuqtaga nisbatan moment olsak;

$$mom_B(\vec{F}) = -BC \cdot F;$$

$$\triangle BCD \text{ dan } BD^2 = BC^2 + CD^2$$

$$2BC^2 = BD^2 \rightarrow BC = BD/\sqrt{2} = \frac{0,2}{1,41} = 0,14$$

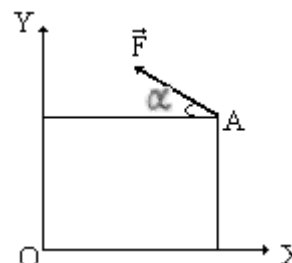
$$mom_B(\vec{F}) = -0,14 \cdot 150 = -21 N \cdot m$$



5^a-rasm

5- MASALA.

Oxy tekislikda yotuvchi $F=420N$ kuch koordinatalari $x_A=0,2m$; $y_A=0,3m$ bo'lgan A nuqtaga $\alpha = 30^\circ$ burchak ostida qo'yilgan. O nuqtaga nisbatan kuchning momentini toping. (151)



6-rasm

Berilgan: $F = 420 \text{ N}$; $X_A = 0,2 \text{ m}$, $Y_A = 0,3 \text{ m}$, $\alpha = 30^\circ$

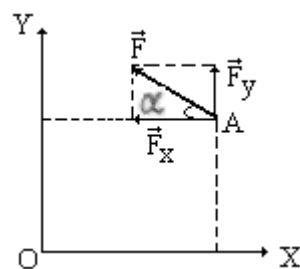
Yechish: $\vec{F}$ – kuchni ox va oy – o'qlari bo'ylab tashkil etuvchilarga ajratamiz va Varin'on teoremasi ko'ra quyidagicha yozish mumkin.

$$\vec{F}_x = F \cdot \cos \alpha = 420 \cdot \frac{\sqrt{3}}{2} = 363,3 \text{ N}$$

$$\vec{F}_y = F \cdot \sin \alpha = 420 \cdot \frac{1}{2} = 210 \text{ N}$$

$$\sum M_0(F_k) = 0 \quad \vec{F}_y \cdot X_A + \vec{F}_x \cdot Y_A = M_0$$

$$M_0 = 210 \cdot 0,2 + 363,3 \cdot 0,3 = 151 \text{ N}$$



6^a-rasm

3. Bog'lanish va bog'lanish reaksiyalari

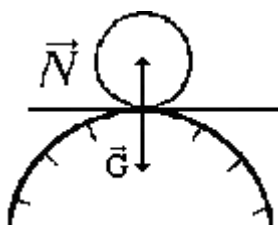
Ta`rif: Jismning harakati yoki holati biror sabab bilan cheklangan bo'lsa, u bog'lanishdagi jism, jismning harakat yoki holatini cheklovchi sabab esa bog'lanish, bog'lanishning jismga ta'sirini beruvchi kuchga boglanish reaksiya kuchi deyiladi.

Umumiy holda tayanch reaksiya kuchining yo'nalishi tashqi kuchlarga bog'liq bo'lib, yo'nalishi tashqi kuchlarga qarama-qarshi yo'nalgan bo'ladi.

Jism qo'zg'almas silliq bo'lmagan sirtga tayangan bo'lsa, sirtning normal reaksiya kuchi $\vec{N}$, $\vec{F}$ - ishqalanish kuchi, $\vec{G}$ - jismning og'irlik kuchi paydo bo'ladi. Jism va jismlar cho'zilmaydigan ip, zanjir, qayish yoki sterjenlar vositasida osilgan bo'lsa, ularda hosil bo'ladigan reaksiya kuchlari mos ravishda iplar, zanjirlar, qayishlar va sterjenlar bo'ylab yo'nalgan bo'ladi. Iplarda hosil bo'ladigan reaksiya kuchlari odatda $\vec{T}_A$, $\vec{T}_B$ bilan belgilanadi va taranglik kuchi deyiladi.

Qo'zg'aluvchan -sharnirli tayanch jismning sharnir o'qi atrofida aylanishiga va tayanch tekisligiga nisbatan parallel ravishda siljishiga imkon beradi. U holda bunday bog'lanish reaksiyasi tayanch tekisligiga perpendikulyar yo'nalgan va moduli jihatdan noma'lum bo'ladi.

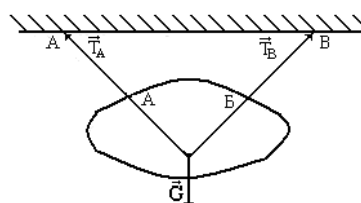
Qo'zg'almas-sharnirli tayanch faqat jismning sharnir o'qi atrofida aylanishiga imkon beradi, lekin hech qanday chiziqli siljishiga imkon bermaydi.



7-rasm

Silliq tekislik

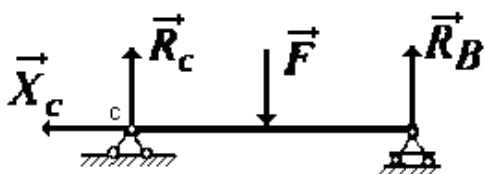
$\vec{N}$ -normal reaksiya kuchi.



8-rasm

Ip, tros, zanjir.

$\vec{T}_A$ va $\vec{T}_B$ taranglik kuchlari

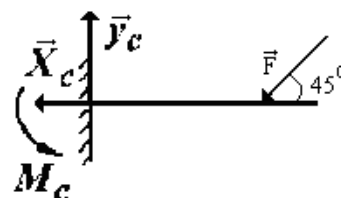


9-rasm

Qo'zg'aluvchan sharnirli (B) va qo'zg'almas sharnirli (C), ikki tayanchli balka

Agar jismlar bir-biri bilan boltlar yordamida bog'langan bo'lsa, bunday bog'lanish sharnirli bog'lanish deyiladi. Qo'zg'almas sharnirli tayanchda tayanch reaksiya kuchi ixtiyoriy tomonga yo'nalgan bo'ladi. Uning xaqiqiy yo'nalishini masalani yechgandan so'ng aniqlanadi. Shuning uchun reaksiya kuchlarini ikkita koordinata o'qlari bo'ylab tashkil etuvchilarga ajratib olinadi.

Qistirib mahkamlangan tayanch balkani qistirib qo'yilgan uchini chiziqli siljishi bilan aylanishiga ham yo'l qo'ymaydi. Bu holda reaksiya kuchlari $\bar{X}_C$, $\bar{Y}_C$ va qarshilik ko'rsatuvchi moment M_C hosil bo'ladi.



10-rasm

Qistirib mahkamlangan tayanch

4. Tekislikda ixtiyoriy joylashgan kuchlar sistemasining analitik muvozanat shartlari

Jismga tekislikda ixtiyoriy ravishda o'rnatilgan $F_1, F_2, \dots, F_n$ kuchlar sistemasi qo'yilgan bo'lsin. Kuchlar Z o'qqa perpendikulyar tekislikda yotganligi uchun ularning shu o'qdagi proeksiyalari nolga teng bo'ladi. Kuchlarning ta'sir chiziqlari X va Y o'qlarga yo'parallel, yoki ularni kesib o'tgani uchun ularning X va Y o'qlarga nisbatan momentlari nolga teng bo'ladi:

$$\sum m_x(\vec{F}_k) = 0 \quad \sum m_y(\vec{F}_k) = 0 \quad \sum m_z(\vec{F}_r) = 0$$

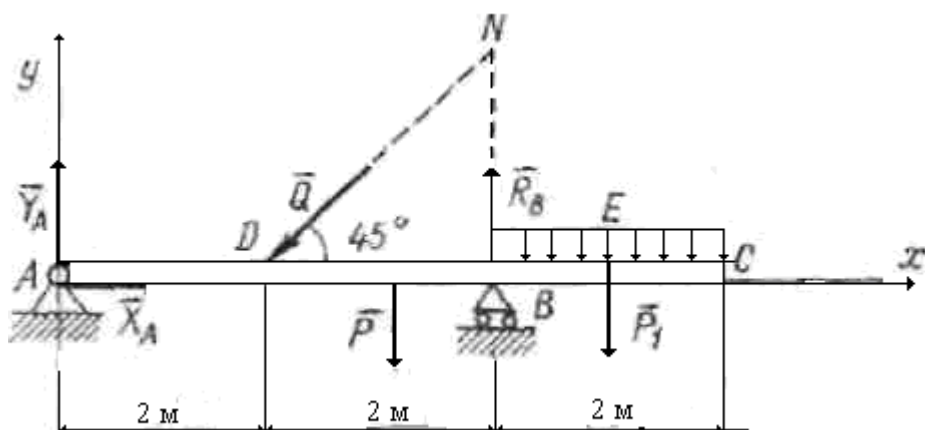
Barcha kuchlar OXU tekislikda yotganligi sababli, ularning Z o'qqa nisbatan momentlari koordinatalar boshi O nuqtaga nisbatan momentlarining qiy-matiga teng bo'lib qoladi: $\sum m_z(\vec{F}_r) = \sum m_0(\vec{F}_r)$

Shu sababli tekislikda ixtiyoriy joylashgan kuchlar sistemasi uchun tenglamalar quyidagi ko'rinishni oladi:

$$\sum (\vec{F}_{rx}) = 0 \quad \sum (\vec{F}_{ky}) = 0 \quad \sum (\vec{F}_{rz}) = 0$$

Mavzuga doir masalalar namunasi.

6- MASALA.



11-rasm

Misol. Og'irligi $P=8N$ bo'lgan AS balkaning D nuqtasiga $Q=6N$ BS qismiga intensivligi $q=3N/m$ bo'lgan tekis taqsimlangan kuch qo'yilgan. Balka V nuqtada erkin tayanchda yotadi. A nuqtada tayanch bilan sharnir vositasida biriktirilgan. A va V nuqtalardagi reaksiya kuchlari aniqlansin. O'lchamlari rasmda ko'rsatilgan.

Yechish. Balkaning SV qismiga qo'yilgan tekis taqsimlangan kuchni E nuqtaga qo'yilgan $P_1 = BC \cdot q = 6N$ kuch bilan almashtiramiz. Og'irlik kuchi R ni va A, V nuqtalarning reaksiya kuchlarini rasmdagidek yo'naltirib, AS balka uchun muvozanat tenglamalarini tuzamiz:

$$\sum M_A(\vec{F}_k) = 0 \quad -2Q \cos 45^\circ - 3P + 4R_B - 5P_1 = 0$$

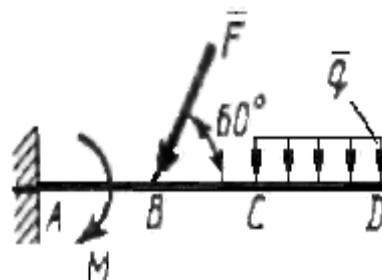
$$\sum M_B(\vec{F}_k) = 0 \quad -1P + 1P + 2Q \cos 45^\circ - 4Y_A = 0$$

$$\sum X_k = 0 \quad X_A - Q \cos 45^\circ = 0$$

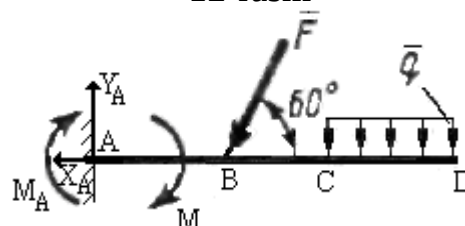
Tenglamalar sistemasidan $R_B=15,6 N$, $Y_A=2,61 N$, $X_A=4,2 N$

7- MASALA.

Qistirib mahkamlangan AD to'singa momenti $M=200 Nm$ bo'lgan juft kuch, F kuchi va intensivligi $q=20N/m$ li taqsimlangan kuchlar ta'sir etib, A tayanchning reaktiv momenti $650 Nm$ ga teng bo'lsa, F kuchining qiymatini aniqlang?
 $AB=BC=CD=2 m$



12-rasm



12^a-rasm

$$M_A = 650 N \cdot m$$

Berilgan: $q = 20 \frac{N}{m}$

$$M = 200 N \cdot m$$

Topish kerak $\vec{F}$ -?

Yechish: Topilishi talab etilgan $\bar{F}$ ni aniqlash uchun A nuqtaga nisbatan moment olishni o'zi kifoya qiladi.

$$\sum M_A(F_k) = 0 \quad M_A - M - F \cdot \sin 60^\circ \cdot AB - q \cdot CD \cdot \left(\frac{CD}{2} + AC \right) = 0$$

$$F = \frac{M_A - M - q \cdot 2 \cdot 5}{2 \cdot \sin 60^\circ} = \frac{650 - 200 - 20 \cdot 10}{2 \cdot \frac{\sqrt{3}}{2}} = \frac{250}{1,73} = 144 \text{ N}$$

S.1-topshiriq. Qattiq jismning tayanch reaksiyalarini aniqlash.

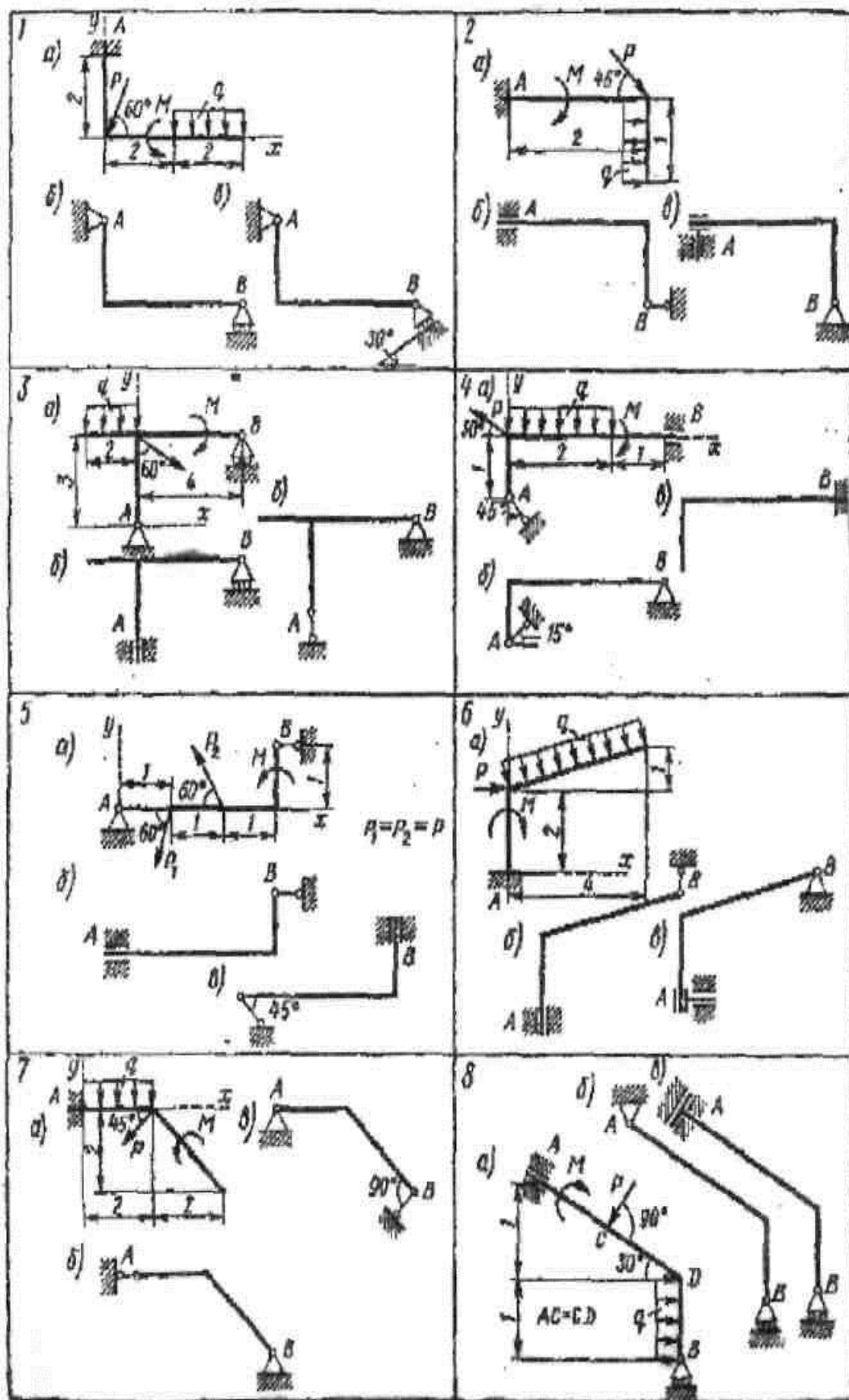
Sxemalarda (1-3-chizmalar) siniq. chiziqdan iborat bo'lgan brusni maxkamlashning uchta usuli ko'rsatilgan. Berilgan yuklama (1-jadvalga qarang) va o'lchamlar (m) uchchala holda ham bir xil.

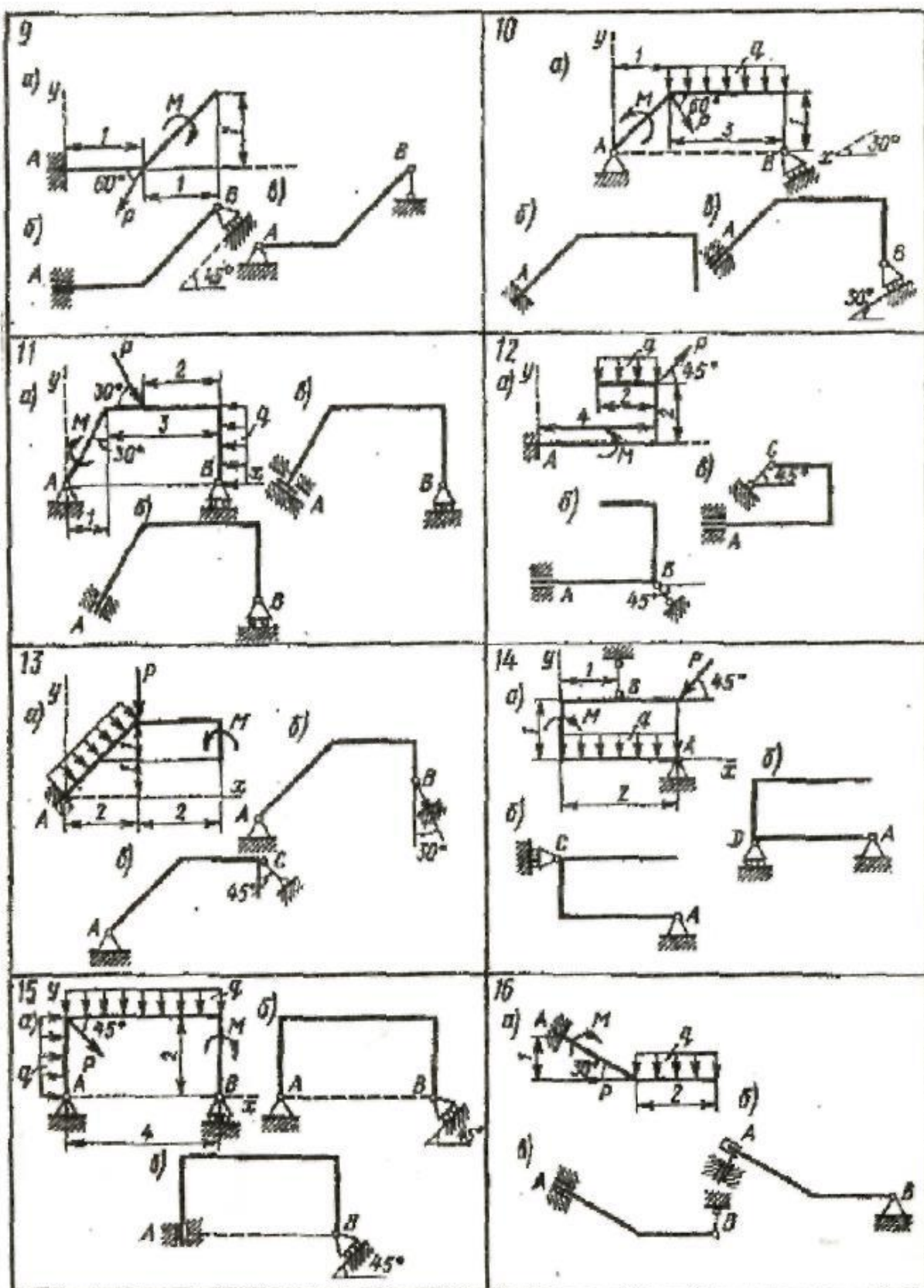
Tayanchlarning reaksiyalari brusni maxkamlashning shunday usuli uchun aniqlansinki, bunda 1-jadvalda ko'rsatilgan reaksiya eng kichik modulga ega bo'lsin.

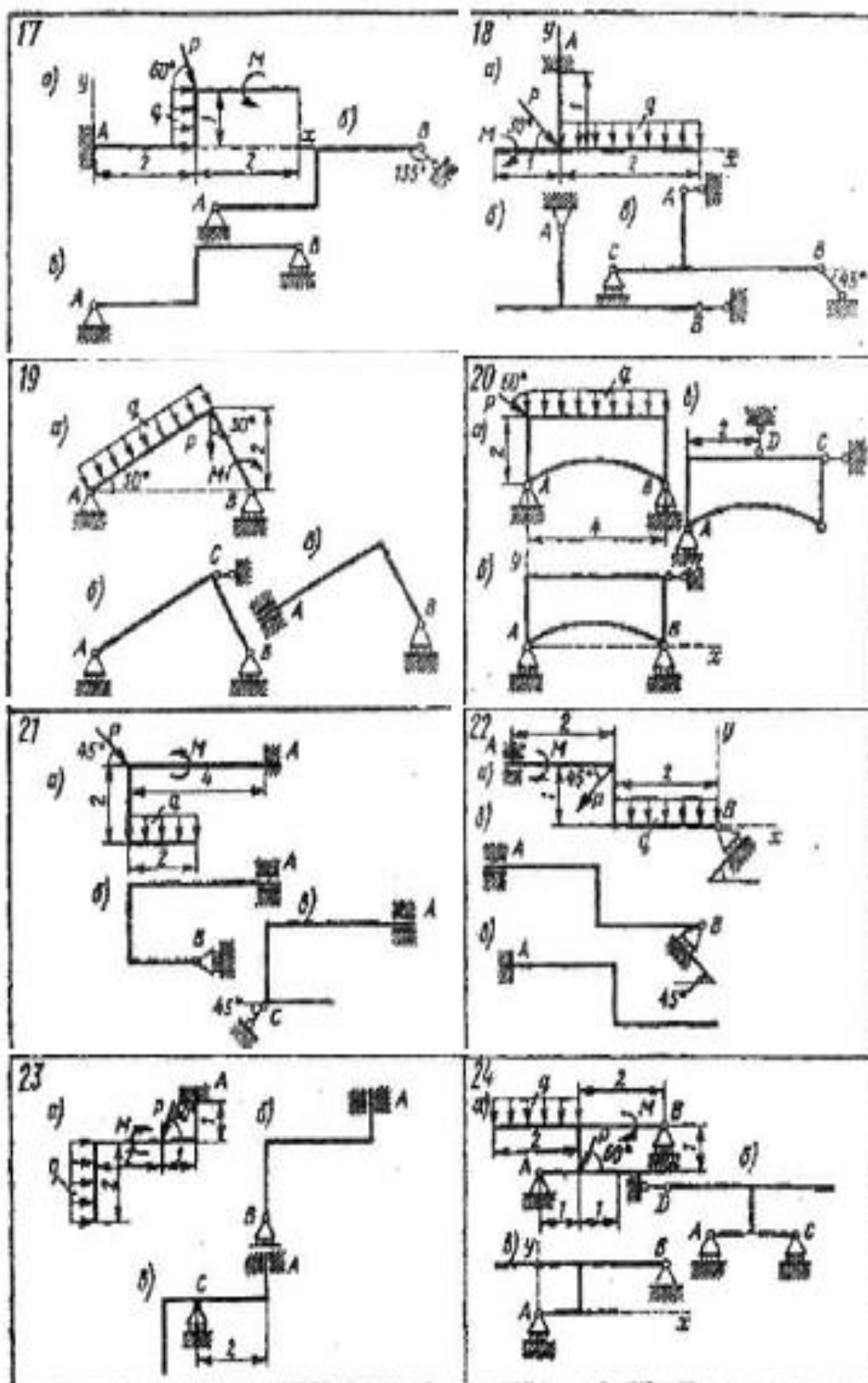
S.1-topshiriq variantlari

1-jadval

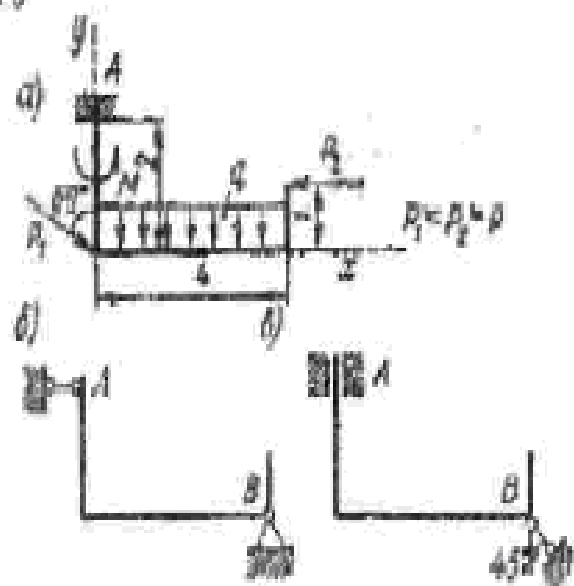
Variant raqami	P, kN	M, kN*m	q, kN/m	Tekshiri-layotgan reaksiya	Variant raqami	P, kN	M, kN.m	q, kN/m	Tekshiri-layotgan reaksiya
1	10	6	2	Y_A	16	12	6	2	M_A
2	20	5	4	M_A	17	20	4	3	Y_A
3	15	8	1	Y_B	18	14	4	2	X_A
4	5	2	1	Y_B	19	16	6	1	R_B
5	10	4	-	X_B	20	10	-	4	Y_A
6	6	2	1	M_A	21	20	10	2	M_A
7	2	4	2	X_A	22	6	6	1	Y_A
8	20	10	4	R_B	23	10	4	2	M_A
9	10	6	-	Y_A	24	4	3	1	Y_A
10	2	4	2	X_A	25	10	10	2	X_A
11	4	10	1	R_B	26	20	5	2	M_A
12	10	5	2	Y_A	27	10	6	1	X_A
13	20	12	2	Y_A	28	20	10	2	Y_A
14	15	4	3	Y_A	29	25	-	1	M_A
15	10	5	2	Y_A	30	20	10	2	R_B



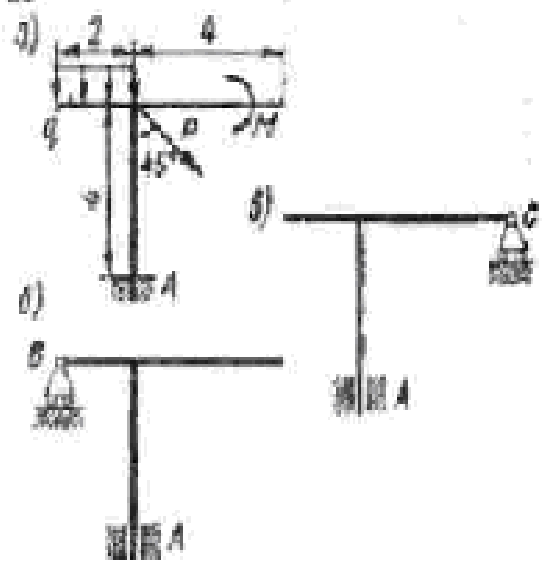




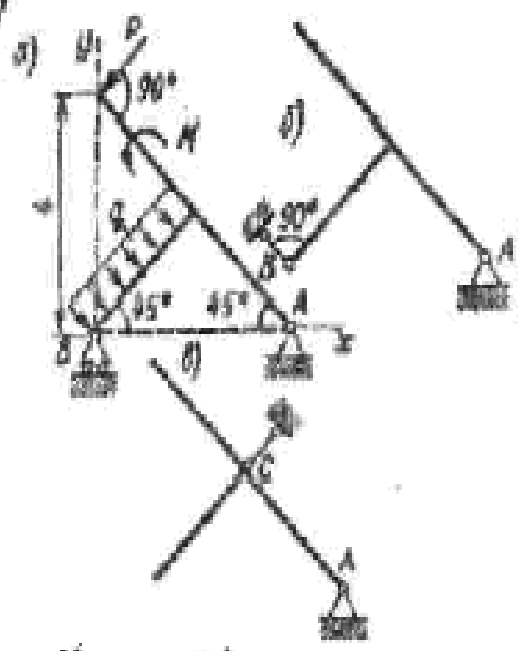
25



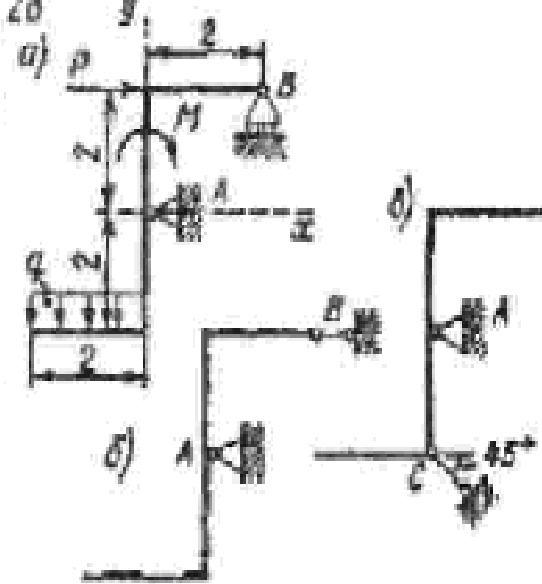
26



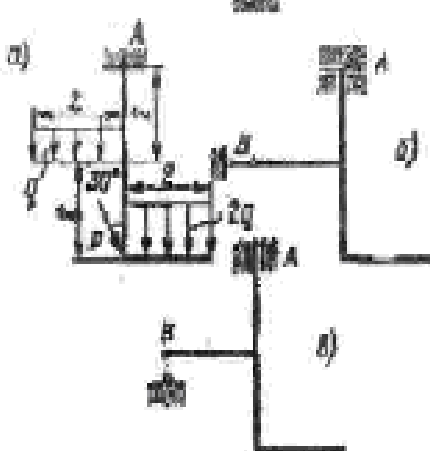
27



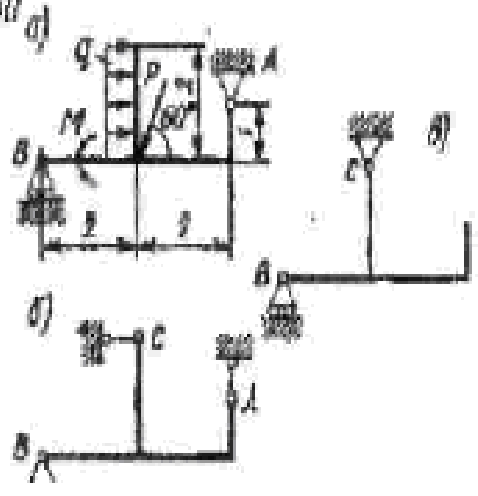
28



29



30



Tonshiriqni bajarish namunasi:

Berilgan: Brusni mahkamlash sxemalari (1.2.3-chizma, a, b, v);

$P=5 \text{ kN}$; $M=- \text{ kN} \cdot \text{ m}$; $q=1,2 \text{ kN/m}$.

Qotirmadagi M_A moment eng kichik son qiymatga ega bo'ladigan tayanch reaksiyalari mahkamlashning usulini aniqlang?

Echish: Konstruksiyaga qo'yilgan muvozanatlashgan kuchlar sistemasini tekshirib chiqamiz. Bog'lanishlarning konstruksiyaga ta'sirini ularning reaksiyalari bilan almashtiramiz (1.2.3-chizmalar):

a) sxemada - X_A , Y_A , M_A ,

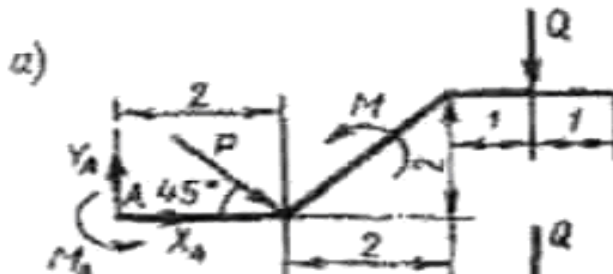
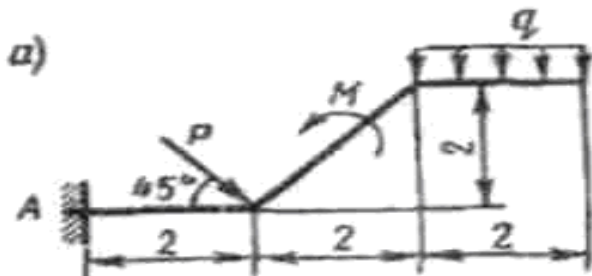
b) sxemada - Y_A , M_A , R_B ;

v) sxemada - M_A , X_A , va Y_B .

Intensivligi q bo'lgan tekis taqsimlangan yuklamani ta'sir etuvchi bilan almashtiramiz.

$$Q = q \cdot 2 = 2,4 \text{ kN}$$

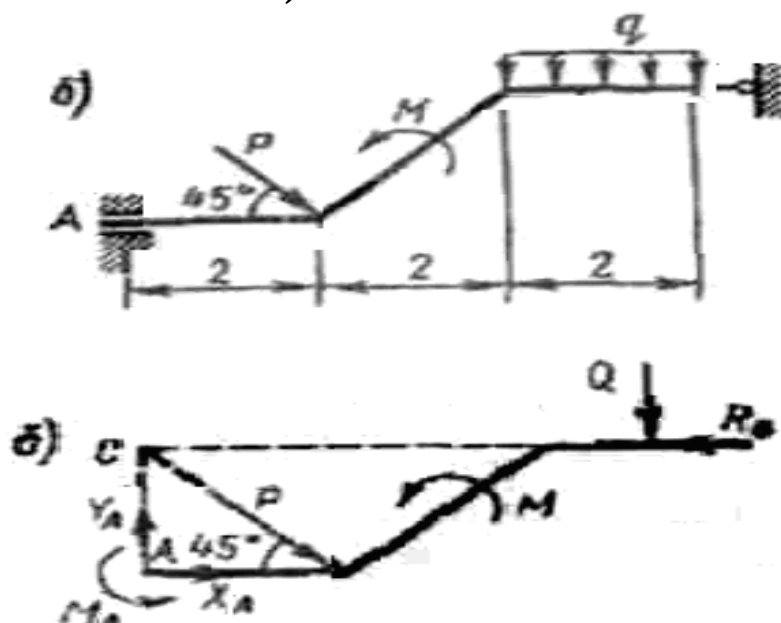
Qaysi holda qotirmadagi moment eng kichik bo'lishini bilishini uchun, qolgan reaksiyalarni aniqlashdan oldin uning qiymatini uchta sxemaning hammasi uchun topib olamiz.

a) sxema uchun

$$\sum M_A(\vec{F}_i) = 0 \quad M_A - P \cdot 2 \cdot \sin 45^\circ + M - Q \cdot 5 = 0$$

Bu yerdan $M_A = 11.07 \text{ kNm}$

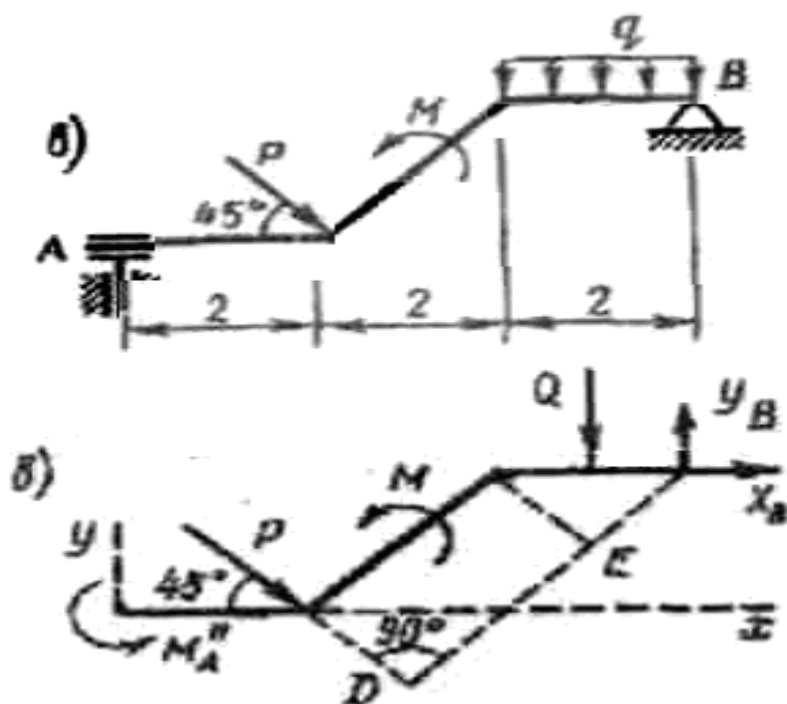
b) sxema uchun



$$\sum M_c(\vec{F}_i) = 0 \quad M_A + M - Q \cdot 5 = 0$$

Bu yerdan $M_A = 4.0 \text{ kNm}$

v) sxema uchun



$$\sum M_B(\vec{F}_i) = 0 \quad M_A + P \cdot BD + M - Q \cdot 1 = 0$$

Chizmadan quyidagini topamiz.

$$BD = BE + ED = \sqrt{2} + 2\sqrt{2} = 4.24 \text{ m}$$

Bu yerdan $M_A = -31.61 \text{ kNm}$

Shunday qilib, Qotirmadagi M_A moment eng kichik son qiymati brusning b) sxema bo'yicha mahkamlangan bo'lar ekan. Endi shu sxema uchun qolgan tayanch reaksiya kuchlarini aniqlaymiz.

$$\sum X_i = 0 \quad P \cdot \cos 45^\circ - R_B = 0 \quad \text{Bu yerdan } R_B = 3.54 \text{ kNm}$$

$$\sum Y_i = 0 \quad -P \cdot \cos 45^\circ + Y_A - Q = 0 \quad \text{Bu yerdan } Y_A = 5.94 \text{ kNm}$$

Hisoblash natijalarini jadvalga to'ldiramiz.

Chizma bo'yicha sxema	Moment, kNm (M_A)	Kuchlar, kN	
		Y_A	R_B
a)	11.07	-	-
b)	4.00	5.94	3.54
v)	-31.61	-	-

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