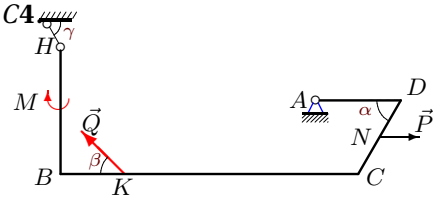
Равновесие тяжелой рамы

Тяжелая однородная рама расположена в вертикальной плоскости и опирается на неподвижный шарнир A и наклонный невесомый стержень H. К раме приложены горизонтальная сила P, наклонная сила Q и момент M. Учитывая погонный вес рамы ρ, найти реакции опор.

Кирсанов М.Н. **Решебник. Теоретическая механика** с. 31.

Вариант 1

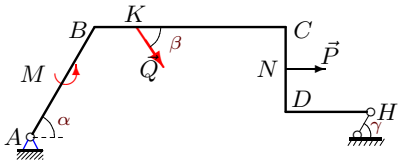
C4



$\rho = 3$ кН/м, $P = 8$ кН,
$Q = 33$ кН, $M = 25$ кНм,
$\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 14$ м,
$CD = 4$ м, $DA = 4$ м,
$BK = 3$ м, $CN = 2$ м.

Вариант 2

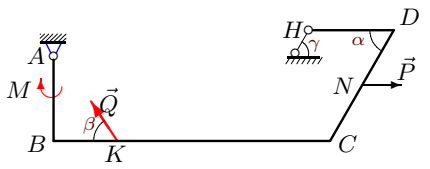
C4.



$\rho = 2$ кН/м, $P = 8$ кН,
$Q = 12$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 9$ м,
$CD = 4$ м, $DH = 4$ м,
$BK = 2$ м, $CN = 2$ м.

Вариант 3

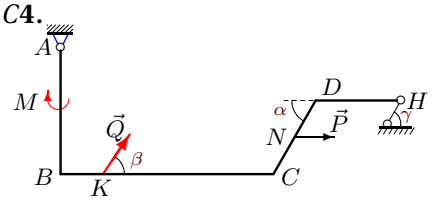
C4.



$\rho = 2$ кН/м, $P = 8$ кН,
$Q = 30$ кН, $M = 20$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 13$ м,
$CD = 6$ м, $DH = 4$ м,
$BK = 3$ м, $CN = 3$ м.

Вариант 4

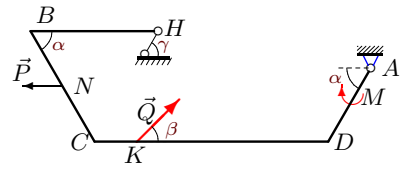
C4.



$\rho = 1$ кН/м, $P = 7$ кН,
$Q = 28$ кН, $M = 15$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 10$ м,
$CD = 4$ м, $DH = 4$ м,
$BK = 2$ м, $CN = 2$ м.

Вариант 5

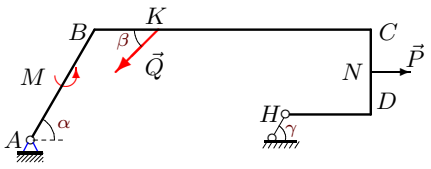
C4.



$\rho = 3$ кН/м, $P = 8$ кН,
$Q = 25$ кН, $M = 25$ кНм,
$\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 6$ м,
$CD = 11$ м, $DA = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 6

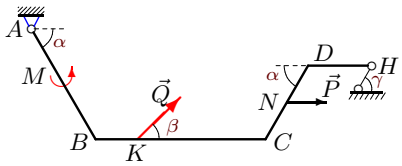
C4.



$\rho = 2$ кН/м, $P = 6$ кН,
$Q = 12$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 13$ м,
$CD = 4$ м, $DH = 4$ м,
$BK = 3$ м, $CN = 2$ м.

Вариант 7

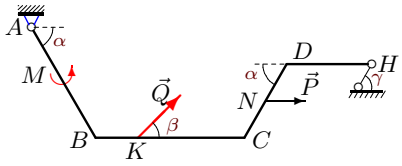
C4.



$\rho = 1$ кН/м, $P = 5$ кН,
$Q = 19$ кН, $M = 30$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 8$ м,
$CD = 4$ м, $DH = 3$ м,
$BK = 2$ м, $CN = 2$ м.

Вариант 8

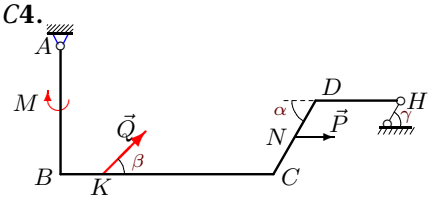
C4.



$\rho = 1$ кН/м, $P = 5$ кН,
$Q = 20$ кН, $M = 30$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 7$ м,
$CD = 4$ м, $DH = 4$ м,
$BK = 2$ м, $CN = 2$ м.

Вариант 9

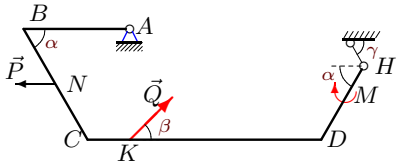
C4.



$\rho = 1$ кН/м, $P = 5$ кН,
$Q = 30$ кН, $M = 15$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 10$ м,
$CD = 4$ м, $DH = 4$ м,
$BK = 2$ м, $CN = 2$ м.

Вариант 10

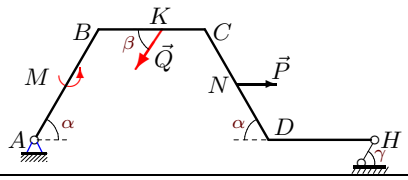
C4.



$\rho = 2$ кН/м, $P = 6$ кН,
$Q = 25$ кН, $M = 20$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 5$ м, $BC = 6$ м,
$CD = 11$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 11

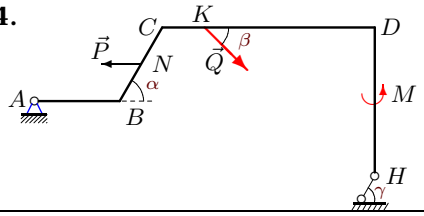
C4.



$\rho = 2$ кН/м, $P = 8$ кН,
$Q = 20$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 5$ м,
$CD = 6$ м, $DH = 5$ м,
$BK = 3$ м, $CN = 3$ м.

Вариант 12

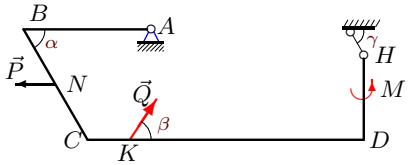
C4.



$\rho = 1$ кН/м, $P = 5$ кН,
$Q = 14$ кН, $M = 30$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 4$ м,
$CD = 10$ м, $DH = 7$ м,
$CK = 2$ м, $CN = 2$ м.

Вариант 13

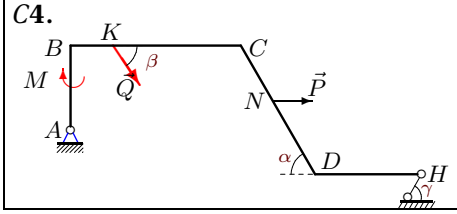
C4.



$\rho = 2$ кН/м, $P = 8$ кН,
$Q = 13$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 6$ м,
$CD = 13$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 14

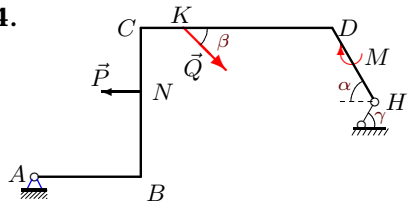
C4.



$\rho = 2$ кН/м, $P = 8$ кН,
$Q = 29$ кН, $M = 20$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 8$ м,
$CD = 7$ м, $DH = 5$ м,
$BK = 2$ м, $CN = 3$ м.

Вариант 15

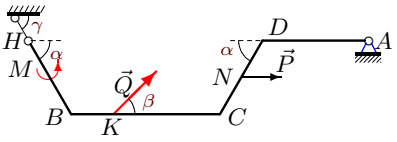
C4.



$\rho = 1$ кН/м, $P = 6$ кН,
$Q = 35$ кН, $M = 15$ кНм,
$\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 5$ м, $BC = 7$ м,
$CD = 9$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 16

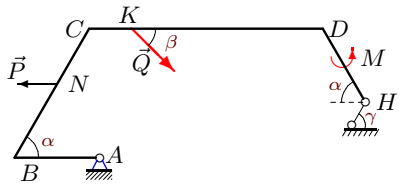
C4.



$\rho = 3$ кН/м, $P = 8$ кН,
$Q = 16$ кН, $M = 70$ кНм,
$\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 7$ м,
$CD = 4$ м, $DA = 5$ м,
$BK = 2$ м, $CN = 2$ м.

Вариант 17

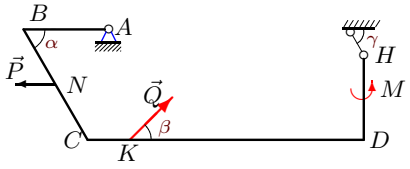
C4.



$\rho = 2$ кН/м, $P = 6$ кН,
$Q = 16$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 7$ м,
$CD = 11$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 18

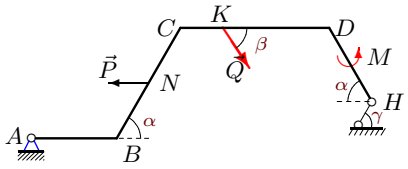
C4.



$\rho = 2$ кН/м, $P = 6$ кН,
$Q = 14$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 6$ м,
$CD = 13$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 19

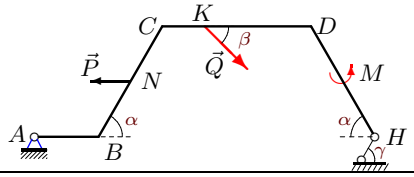
C4.



$\rho = 2$ кН/м, $P = 8$ кН,
$Q = 19$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 6$ м,
$CD = 7$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 20

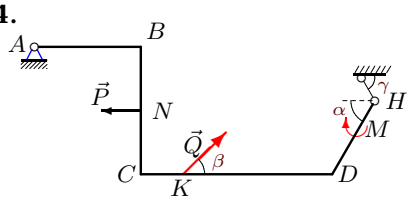
C4.



$\rho = 1$ кН/м, $P = 6$ кН,
$Q = 19$ кН, $M = 30$ кНм,
$\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 3$ м, $BC = 6$ м,
$CD = 7$ м, $DH = 6$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 21

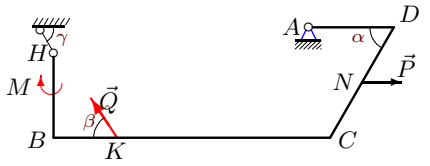
C4.



$\rho = 2$ кН/м, $P = 7$ кН,
$Q = 28$ кН, $M = 20$ кНм,
$\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 5$ м, $BC = 6$ м,
$CD = 9$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 22

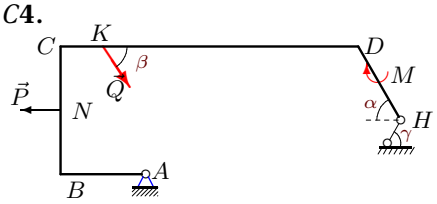
C4.



$\rho = 3$ кН/м, $P = 9$ кН,
$Q = 34$ кН, $M = 25$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 13$ м,
$CD = 6$ м, $DA = 4$ м,
$BK = 3$ м, $CN = 3$ м.

Вариант 23

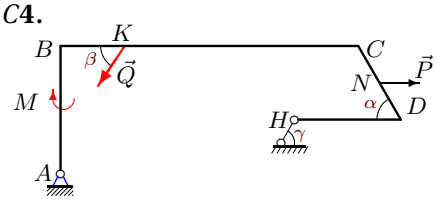
C4.



$\rho = 1$ кН/м, $P = 7$ кН,
$Q = 31$ кН, $M = 15$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 6$ м,
$CD = 14$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 3$ м.

Вариант 24

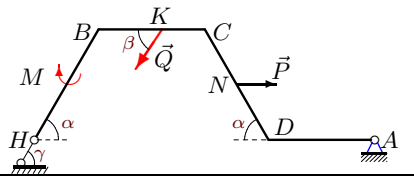
C4.



$\rho = 1$ кН/м, $P = 7$ кН,
$Q = 27$ кН, $M = 15$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 14$ м,
$CD = 4$ м, $DH = 5$ м,
$BK = 3$ м, $CN = 2$ м.

Вариант 25

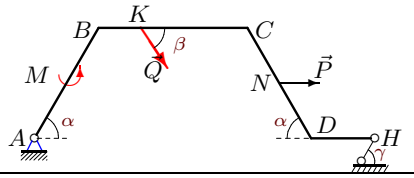
C4.



$\rho = 3$ кН/м, $P = 9$ кН,
$Q = 23$ кН, $M = 25$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 5$ м,
$CD = 6$ м, $DA = 5$ м,
$BK = 3$ м, $CN = 3$ м.

Вариант 26

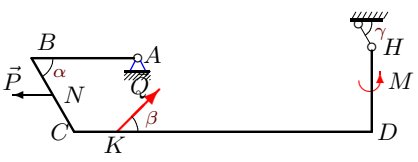
C4.



$\rho = 2$ кН/м, $P = 8$ кН,
$Q = 21$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 7$ м,
$CD = 6$ м, $DH = 3$ м,
$BK = 2$ м, $CN = 3$ м.

Вариант 27

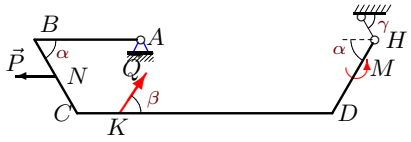
C4.



$\rho = 2$ кН/м, $P = 6$ кН,
$Q = 13$ кН, $M = 50$ кНм,
$\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 5$ м, $BC = 4$ м,
$CD = 14$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 2$ м.

Вариант 28

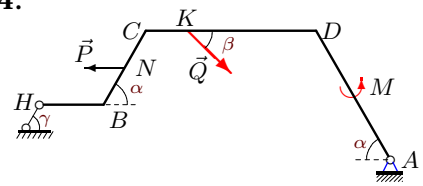
C4.



$\rho = 1$ кН/м, $P = 7$ кН,
$Q = 18$ кН, $M = 30$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 5$ м, $BC = 4$ м,
$CD = 12$ м, $DH = 4$ м,
$CK = 2$ м, $CN = 2$ м.

Вариант 29

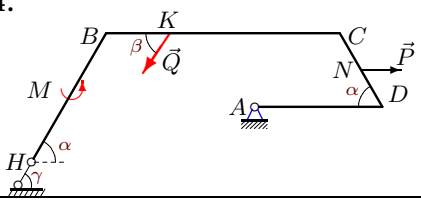
C4.



$\rho = 3$ кН/м, $P = 8$ кН,
$Q = 20$ кН, $M = 70$ кНм,
$\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 3$ м, $BC = 4$ м,
$CD = 8$ м, $DA = 7$ м,
$CK = 2$ м, $CN = 2$ м.

Вариант 30

C4.



$\rho = 3$ кН/м, $P = 9$ кН,
$Q = 16$ кН, $M = 70$ кНм,
$\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 7$ м, $BC = 11$ м,
$CD = 4$ м, $DA = 6$ м,
$BK = 3$ м, $CN = 2$ м.

Ответы

	$M_A(Q)$	$M_A(P)$	$\Sigma_k M_A(G_k)$	h	X_A	Y_A	R_H
1	-290.844	13.856	366.0	-9.124	18.842	54.590	7.016
2	-83.138	-25.569	-361.0	10.468	-42.351	28.041	40.095
3	17.942	11.215	-455.0	7.639	-34.267	-13.248	58.360
4	132.497	29.876	-150.0	10.196	-21.223	-0.378	0.258
5	-133.217	-6.928	754.5	-9.526	-40.611	9.745	61.866
6	18.000	-19.177	-505.0	7.639	-37.831	17.776	59.713
7	133.000	17.321	-156.5	9.500	-19.283	12.754	-2.507
8	140.000	17.321	-154.5	9.500	-19.329	12.727	-3.455
9	185.885	21.340	-150.0	10.196	-27.394	11.071	-4.141
10	112.500	-15.588	-90.0	6.553	-14.238	38.088	1.997
11	-51.962	-20.785	-322.0	11.314	-19.547	39.774	30.472
12	-98.000	8.660	-250.0	11.062	-31.342	18.018	27.964
13	22.517	-20.785	-81.0	6.225	4.824	43.417	4.701
14	-108.229	-11.215	-340.5	13.125	-48.356	47.259	36.566
15	-346.482	24.000	-193.0	4.938	-111.788	-3.967	107.432
16	-96.573	13.856	510.0	-13.856	-1.370	17.606	35.888
17	-96.000	20.785	-154.5	7.002	-26.006	41.850	25.667
18	70.000	-15.588	-193.0	7.639	2.075	38.800	11.596
19	-197.454	20.785	-349.0	10.089	-34.838	25.116	47.147
20	-177.291	15.588	-185.0	8.000	-41.719	15.641	39.588
21	257.387	-21.000	-376.0	9.521	-0.944	16.346	16.765
22	-353.338	23.383	289.5	-10.990	5.022	56.713	-5.956
23	-39.306	21.000	-54.0	3.804	-28.377	43.371	22.952
24	10.852	-29.876	-225.5	3.304	-61.528	13.107	78.552
25	258.942	-23.383	573.0	-13.856	-25.774	36.946	56.548
26	-145.492	-20.785	-334.0	11.314	-46.642	34.044	39.799
27	32.500	-10.392	-143.0	8.157	0.887	41.355	8.691
28	15.588	-12.124	-47.5	5.500	0.210	8.136	2.552
29	48.618	34.641	501.8	-15.588	-27.152	43.753	42.019
30	83.138	-15.588	119.2	-7.794	-17.474	69.323	32.947