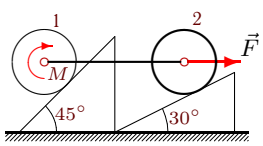
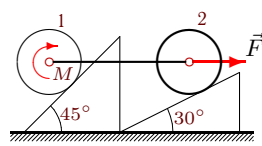
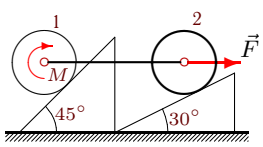
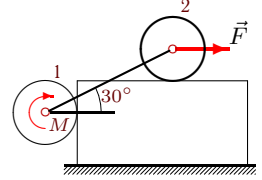
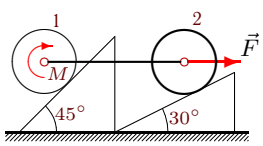
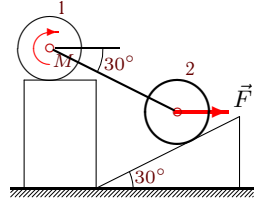
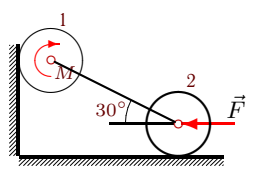
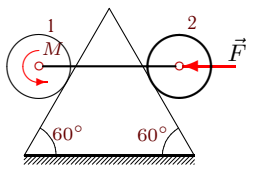
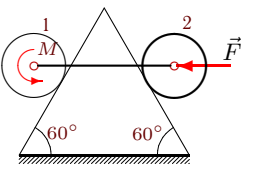
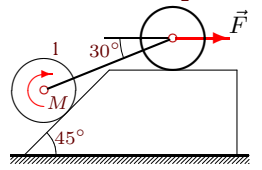


Трение качения

Система состоит из двух цилиндров весом G_1 и G_2 с одинаковыми радиусами R , соединенных однородным стержнем весом G_3 . Цилиндры могут кататься без проскальзывания, цилиндр 1 без сопротивления, а цилиндр 2 с трением качения (δ). В каких пределах меняется внешний момент M при условии равновесия системы?

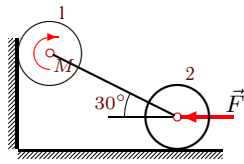
В ответах даны нормальные реакции опор и момент M для движения цилиндра 2 по часовой стрелке и против (последние три столбца).

Кирсанов М.Н. Решебник. Теоретическая механика с. 80.

<p>Вариант 1 С18.</p>  <p>$P_1 = 21 \text{ Н}, P_2 = 24 \text{ Н}, P_3 = 50 \text{ Н},$ $F = 5 \text{ Н}, R = 25 \text{ см}, \delta = 2 \text{ мм}.$</p>	<p>Вариант 2 С18.</p>  <p>$P_1 = 25 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 20 \text{ Н},$ $F = 25 \text{ Н}, R = 65 \text{ см}, \delta = 4 \text{ мм}.$</p>
<p>Вариант 3 С18.</p>  <p>$P_1 = 23 \text{ Н}, P_2 = 28 \text{ Н}, P_3 = 20 \text{ Н},$ $F = 15 \text{ Н}, R = 25 \text{ см}, \delta = 1 \text{ мм}.$</p>	<p>Вариант 4 С18.</p>  <p>$P_1 = 22 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 50 \text{ Н},$ $F = 10 \text{ Н}, R = 60 \text{ см}, \delta = 5 \text{ мм}.$</p>
<p>Вариант 5 С18.</p>  <p>$P_1 = 23 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 20 \text{ Н},$ $F = 15 \text{ Н}, R = 65 \text{ см}, \delta = 5 \text{ мм}.$</p>	<p>Вариант 6 С18.</p>  <p>$P_1 = 21 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 20 \text{ Н},$ $F = 5 \text{ Н}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$</p>
<p>Вариант 7 С18.</p>  <p>$P_1 = 5 \text{ Н}, P_2 = 23 \text{ Н}, P_3 = 20 \text{ Н},$ $F = 20 \text{ Н}, R = 60 \text{ см}, \delta = 5 \text{ мм}.$</p>	<p>Вариант 8 С18.</p>  <p>$P_1 = 12 \text{ Н}, P_2 = 25 \text{ Н}, P_3 = 10 \text{ Н},$ $F = 20 \text{ Н}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$</p>
<p>Вариант 9 С18.</p>  <p>$P_1 = 12 \text{ Н}, P_2 = 29 \text{ Н}, P_3 = 10 \text{ Н},$ $F = 25 \text{ Н}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$</p>	<p>Вариант 10 С18.</p>  <p>$P_1 = 24 \text{ Н}, P_2 = 25 \text{ Н}, P_3 = 50 \text{ Н},$ $F = 20 \text{ Н}, R = 30 \text{ см}, \delta = 1 \text{ мм}.$</p>

Вариант 11

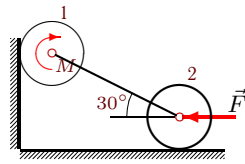
С18.



$P_1 = 5 \text{ H}$, $P_2 = 25 \text{ H}$, $P_3 = 20 \text{ H}$,
 $F = 30 \text{ H}$, $R = 55 \text{ см}$, $\delta = 4 \text{ мм}$.

Вариант 12

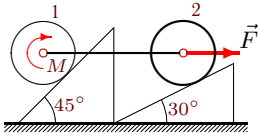
С18.



$P_1 = 6 \text{ H}$, $P_2 = 29 \text{ H}$, $P_3 = 30 \text{ H}$,
 $F = 40 \text{ H}$, $R = 60 \text{ см}$, $\delta = 4 \text{ мм}$.

Вариант 13

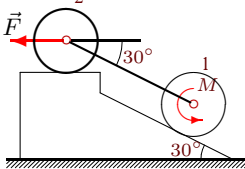
С18.



$P_1 = 25 \text{ H}$, $P_2 = 26 \text{ H}$, $P_3 = 10 \text{ H}$,
 $F = 25 \text{ H}$, $R = 75 \text{ см}$, $\delta = 5 \text{ мм}$.

Вариант 14

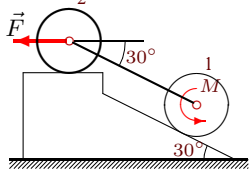
С18.



$P_1 = 25 \text{ H}$, $P_2 = 26 \text{ H}$, $P_3 = 20 \text{ H}$,
 $F = 25 \text{ H}$, $R = 35 \text{ см}$, $\delta = 1 \text{ мм}$.

Вариант 15

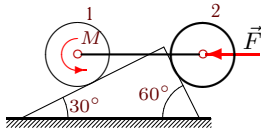
С18.



$P_1 = 24 \text{ H}$, $P_2 = 27 \text{ H}$, $P_3 = 50 \text{ H}$,
 $F = 20 \text{ H}$, $R = 70 \text{ см}$, $\delta = 5 \text{ мм}$.

Вариант 16

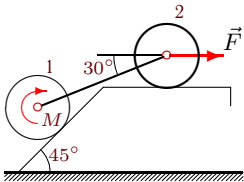
С18.



$P_1 = 23 \text{ H}$, $P_2 = 26 \text{ H}$, $P_3 = 10 \text{ H}$,
 $F = 15 \text{ H}$, $R = 65 \text{ см}$, $\delta = 5 \text{ мм}$.

Вариант 17

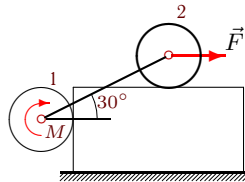
С18.



$P_1 = 25 \text{ H}$, $P_2 = 27 \text{ H}$, $P_3 = 50 \text{ H}$,
 $F = 25 \text{ H}$, $R = 75 \text{ см}$, $\delta = 5 \text{ мм}$.

Вариант 18

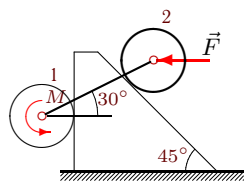
С18.



$P_1 = 25 \text{ H}$, $P_2 = 28 \text{ H}$, $P_3 = 20 \text{ H}$,
 $F = 25 \text{ H}$, $R = 55 \text{ см}$, $\delta = 3 \text{ мм}$.

Вариант 19

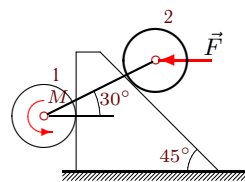
С18.



$P_1 = 23 \text{ H}$, $P_2 = 24 \text{ H}$, $P_3 = 10 \text{ H}$,
 $F = 15 \text{ H}$, $R = 65 \text{ см}$, $\delta = 5 \text{ мм}$.

Вариант 20

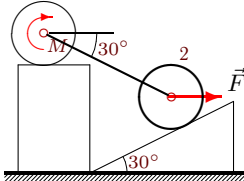
С18.



$P_1 = 24 \text{ H}$, $P_2 = 29 \text{ H}$, $P_3 = 40 \text{ H}$,
 $F = 20 \text{ H}$, $R = 30 \text{ см}$, $\delta = 1 \text{ мм}$.

Вариант 21

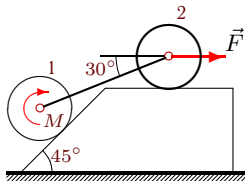
С18.



$P_1 = 24 \text{ H}$, $P_2 = 25 \text{ H}$, $P_3 = 20 \text{ H}$,
 $F = 20 \text{ H}$, $R = 40 \text{ см}$, $\delta = 2 \text{ мм}$.

Вариант 22

С18.



$P_1 = 23 \text{ H}$, $P_2 = 28 \text{ H}$, $P_3 = 40 \text{ H}$,
 $F = 15 \text{ H}$, $R = 65 \text{ см}$, $\delta = 5 \text{ мм}$.

Вариант 23
C18.

$P_1 = 24 \text{ H}, P_2 = 25 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$

Вариант 24
C18.

$P_1 = 21 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 5 \text{ H}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$

Вариант 25
C18.

$P_1 = 5 \text{ H}, P_2 = 22 \text{ H}, P_3 = 20 \text{ H},$
 $F = 10 \text{ H}, R = 45 \text{ см}, \delta = 4 \text{ мм}.$

Вариант 26
C18.

$P_1 = 23 \text{ H}, P_2 = 28 \text{ H}, P_3 = 20 \text{ H},$
 $F = 15 \text{ H}, R = 35 \text{ см}, \delta = 2 \text{ мм}.$

Вариант 27
C18.

$P_1 = 22 \text{ H}, P_2 = 23 \text{ H}, P_3 = 30 \text{ H},$
 $F = 10 \text{ H}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$

Вариант 28
C18.

$P_1 = 12 \text{ H}, P_2 = 27 \text{ H}, P_3 = 50 \text{ H},$
 $F = 25 \text{ H}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$

Вариант 29
C18.

$P_1 = 22 \text{ H}, P_2 = 24 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 20 \text{ см}, \delta = 1 \text{ мм}.$

Вариант 30
C18.

$P_1 = 24 \text{ H}, P_2 = 26 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 50 \text{ см}, \delta = 3 \text{ мм}.$

Ответы

	N_1	N_2	M	N_1	N_2	M
	H		Hm	H		Hm
1	15.687	56.843	12.342	16.426	56.320	12.157
2	27.106	42.876	14.555	27.535	42.573	14.276
3	18.284	43.980	7.096	18.571	43.778	7.025
4	9.529	56.502	24.899	10.475	57.048	24.571
5	18.982	41.755	17.997	19.504	41.385	17.657
6	16.943	58.024	3.652	17.708	56.699	3.453
7	20.373	44.762	-1.943	19.631	44.334	-2.200
8	35.495	59.315	0.518	36.880	60.701	0.998
9	37.515	67.665	0.710	38.188	68.338	0.846
10	40.564	61.429	3.771	40.687	61.666	3.634
11	30.382	52.541	1.398	29.621	52.102	1.156
12	40.449	67.353	1.412	39.554	66.837	1.102
13	26.040	35.934	12.290	26.429	35.658	11.998
14	30.311	50.517	-4.037	30.311	50.351	-3.920
15	42.435	63.810	0.616	42.435	63.286	1.350
16	43.125	61.185	12.151	44.079	62.837	13.225
17	42.695	66.179	5.973	42.960	66.690	5.232
18	24.715	52.269	11.402	25.287	52.599	11.220
19	31.421	66.159	-6.408	34.928	70.070	-5.092
20	67.234	123.780	-1.555	70.030	126.899	-1.070
21	33.616	40.977	0.266	34.022	40.273	-0.015
22	34.759	56.410	9.204	35.019	56.913	8.572
23	19.718	56.384	13.046	20.284	56.711	12.916
24	62.791	79.087	5.513	63.857	80.935	5.791
25	10.337	37.968	-4.064	9.666	37.581	-4.239
26	52.581	96.123	-0.925	56.337	100.312	-0.166
27	9.673	43.585	12.566	10.330	43.964	12.414
28	74.337	103.488	0.068	75.367	104.517	0.276
29	69.042	87.244	7.117	69.922	88.769	7.422
30	67.396	91.054	14.367	68.500	92.966	15.323