

Варианты задания РГР 4
«Определение реакций опор твёрдого тела в пространственной системе сил»

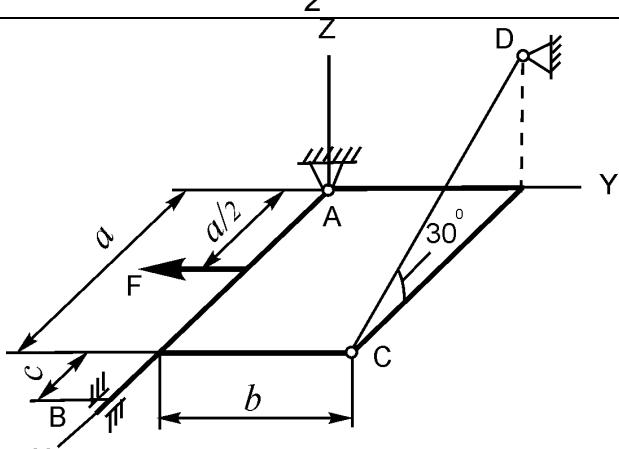
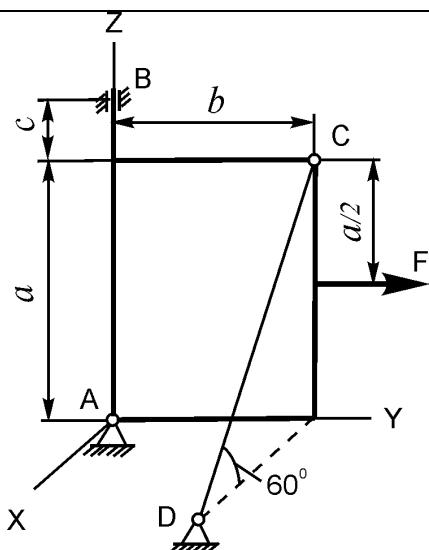
Для закрепления изложенного теоретического материала необходимо выполнить курсовое задание С 4.

В вариантах 1 - 15 этого курсового задания (табл. 1.4) рассматривается равновесие однородной прямоугольной плиты с размерами a и b и весом G . На плиту действует активная сила F , которая параллельна соответствующей координатной оси системы отсчёта OXYZ. Требуется определить реакции внешних связей, наложенных на плиту. По условию задания CD – невесомый стержень.

В вариантах 16 – 30 рассматривается равновесие вала, на котором установлены два круглых колеса с радиусами R_1 , R_2 . Эти колёса загружены активными силами F_1 – F_5 . По условию задания активные силы параллельны соответствующим координатным осям системы отсчёта OXYZ. Требуется определить реакции внешних связей, наложенных на конструкцию, и величину силы F_4 .

Исходные данные для расчёта и определяемые величины приведены в табл. 1.4.

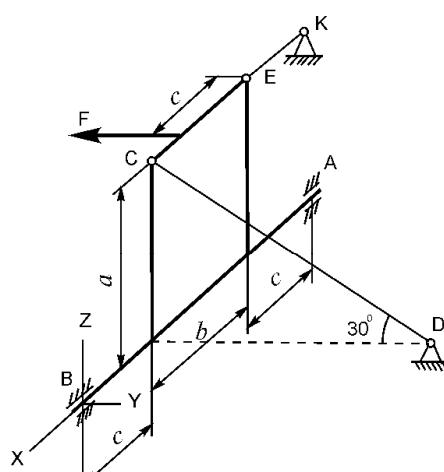
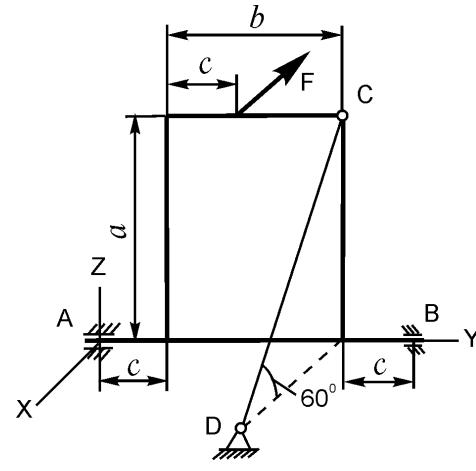
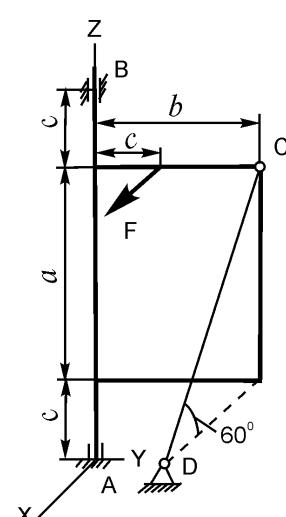
Таблица 1.4

Номер варианта	Расчётная схема	Исходные данные	Определяемые величины
1	2	3	4
1		$G = 8 \text{ кН}$; $F = 5 \text{ кН}$; $a = 3 \text{ м}$; $b = 2 \text{ м}$; $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $Z_B = ?$ $R_C = ?$
2		$G = 8 \text{ кН}$; $F = 6 \text{ кН}$; $a = 3 \text{ м}$; $b = 2 \text{ м}$; $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $X_B = ?$ $R_C = ?$

1	2	3	4
3		$G = 8 \text{ кН};$ $F = 7 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $Z_B = ?$ $R_C = ?$
4		$G = 8 \text{ кН};$ $F = 8 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $Z_B = ?$ $R_C = ?$
5		$G = 8 \text{ кН};$ $F = 9 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $R_C = ?$

1	2	3	4
6		$G = 8 \text{ кН};$ $F = 10 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $X_B = ?$ $R_C = ?$
7		$G = 8 \text{ кН};$ $F = 4 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $Z_B = ?$ $R_C = ?$
8		$G = 8 \text{ кН};$ $F = 3 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $R_C = ?$

1	2	3	4
9	<p>Diagram for problem 9: A truss structure with a vertical column AC and a diagonal member CD. Point C is at height a from the base A. Point D is at height b from the base A and makes a 30° angle with the horizontal. A force F acts at point C along the line CD. A coordinate system (X, Y, Z) is shown at point A.</p>	$G = 8 \text{ кН};$ $F = 2 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $Z_B = ?$ $R_C = ?$
10	<p>Diagram for problem 10: A truss structure with a vertical column AC and a diagonal member CD. Point C is at height a from the base A. Point D is at height c from the base A and makes a 60° angle with the horizontal. A force F acts at point C along the line CD. A coordinate system (X, Y, Z) is shown at point A.</p>	$G = 8 \text{ кН};$ $F = 2 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $R_C = ?$
11	<p>Diagram for problem 11: A truss structure with a horizontal beam AB and a diagonal member CD. Point A is at height c from the base. Point B is at height b from the base. Point C is at height a from the base. Point D is at height c from the base and makes a 30° angle with the horizontal. A force F acts at point A vertically upwards. A coordinate system (X, Y, Z) is shown at point A.</p>	$G = 8 \text{ кН};$ $F = 5 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $R_C = ?$ $R_E = ?$

1	2	3	4
12	 <p>Diagram of a truss structure (Task 12). It consists of vertical columns and diagonal members. A horizontal force F acts at joint C. Joint E is at height c above joint C. Joint K is at height c above joint E. Joint A is at height a above joint C. Joint D is at height b above joint C. A dashed line from D makes a 30° angle with the horizontal. A coordinate system (X, Y, Z) is shown at joint C.</p>	$G = 8 \text{ кН};$ $F = 6 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$Y_A = ?$ $Z_A = ?$ $Y_B = ?$ $Z_B = ?$ $R_C = ?$ $R_E = ?$
13	 <p>Diagram of a truss structure (Task 13). It has a central vertical column and two horizontal beams. A horizontal force F acts at joint C. Joint C is at height c above joint A. Joint A is at height a above joint D. Joint B is at height c above joint D. A dashed line from D makes a 60° angle with the horizontal. A coordinate system (X, Y, Z) is shown at joint A.</p>	$G = 8 \text{ кН};$ $F = 4 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $R_C = ?$
14	 <p>Diagram of a truss structure (Task 14). It has a central vertical column and two horizontal beams. A horizontal force F acts at joint C. Joint C is at height c above joint A. Joint A is at height a above joint D. Joint B is at height c above joint D. A dashed line from D makes a 60° angle with the horizontal. A coordinate system (X, Y, Z) is shown at joint A.</p>	$G = 8 \text{ кН};$ $F = 10 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $R_C = ?$

1	2	3	4
15		$G = 8 \text{ кН};$ $F = 8 \text{ кН};$ $a = 3 \text{ м};$ $b = 2 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $R_C = ?$
16		$F_1 = 4 \text{ кН};$ $F_2 = 1,2 \text{ кН};$ $F_3 = 0,4 \text{ кН};$ $F_5 = 0,5 \text{ кН};$ $R_1 = 0,09 \text{ м};$ $R_2 = 0,27 \text{ м};$ $a = 0,1 \text{ м};$ $b = 0,2 \text{ м};$ $c = 0,1 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$
17		$F_1 = 10 \text{ кН};$ $F_2 = 3 \text{ кН};$ $F_3 = 1 \text{ кН};$ $F_5 = 1,5 \text{ кН};$ $R_1 = 0,05 \text{ м};$ $R_2 = 0,12 \text{ м};$ $a = 0,1 \text{ м};$ $b = 0,15 \text{ м};$ $c = 0,22 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$
18		$F_1 = 8 \text{ кН};$ $F_2 = 2,5 \text{ кН};$ $F_3 = 1 \text{ кН};$ $F_5 = 2 \text{ кН};$ $R_1 = 0,2 \text{ м};$ $R_2 = 0,3 \text{ м};$ $a = 0,1 \text{ м};$ $b = 0,12 \text{ м};$ $c = 0,2 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$

1	2	3	4
19	<p style="text-align: center;">Z</p> <p style="text-align: center;">c</p> <p style="text-align: center;">a</p> <p style="text-align: center;">b</p> <p style="text-align: center;">R_1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">R_2</p> <p style="text-align: center;">2</p> <p style="text-align: center;">A</p> <p style="text-align: center;">B</p> <p style="text-align: center;">Y</p> <p style="text-align: center;">X</p>	$F_1 = 12 \text{ кН};$ $F_2 = 4 \text{ кН};$ $F_3 = 1,5 \text{ кН};$ $F_5 = 2 \text{ кН};$ $R_1 = 0,1 \text{ м};$ $R_2 = 0,2 \text{ м};$ $a = 0,1 \text{ м};$ $b = 0,2 \text{ м};$ $c = 0,4 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$
20	<p style="text-align: center;">Z</p> <p style="text-align: center;">F_2</p> <p style="text-align: center;">F_1</p> <p style="text-align: center;">F_3</p> <p style="text-align: center;">F_4</p> <p style="text-align: center;">2</p> <p style="text-align: center;">R_1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">R_2</p> <p style="text-align: center;">B</p> <p style="text-align: center;">a</p> <p style="text-align: center;">b</p> <p style="text-align: center;">c</p> <p style="text-align: center;">A</p> <p style="text-align: center;">Y</p> <p style="text-align: center;">X</p>	$F_1 = 3 \text{ кН};$ $F_2 = 1 \text{ кН};$ $F_3 = 0,5 \text{ кН};$ $F_5 = 1,2 \text{ кН};$ $R_1 = 0,07 \text{ м};$ $R_2 = 0,25 \text{ м};$ $a = 0,12 \text{ м};$ $b = 0,15 \text{ м};$ $c = 0,45 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$
21	<p style="text-align: center;">Z</p> <p style="text-align: center;">b</p> <p style="text-align: center;">a</p> <p style="text-align: center;">R_1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">R_2</p> <p style="text-align: center;">2</p> <p style="text-align: center;">F_3</p> <p style="text-align: center;">F_2</p> <p style="text-align: center;">F_1</p> <p style="text-align: center;">F_5</p> <p style="text-align: center;">F_4</p> <p style="text-align: center;">c</p> <p style="text-align: center;">A</p> <p style="text-align: center;">B</p> <p style="text-align: center;">Y</p> <p style="text-align: center;">X</p>	$F_1 = 9 \text{ кН};$ $F_2 = 3,5 \text{ кН};$ $F_3 = 2 \text{ кН};$ $F_5 = 1,25 \text{ кН};$ $R_1 = 0,06 \text{ м};$ $R_2 = 0,15 \text{ м};$ $a = 0,2 \text{ м};$ $b = 0,3 \text{ м};$ $c = 0,7 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $Z_B = ?$ $F_4 = ?$
22	<p style="text-align: center;">Z</p> <p style="text-align: center;">b</p> <p style="text-align: center;">a</p> <p style="text-align: center;">R_1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">R_2</p> <p style="text-align: center;">2</p> <p style="text-align: center;">F_3</p> <p style="text-align: center;">F_2</p> <p style="text-align: center;">F_1</p> <p style="text-align: center;">F_5</p> <p style="text-align: center;">F_4</p> <p style="text-align: center;">c</p> <p style="text-align: center;">A</p> <p style="text-align: center;">B</p> <p style="text-align: center;">Y</p> <p style="text-align: center;">X</p>	$F_1 = 3 \text{ кН};$ $F_2 = 1 \text{ кН};$ $F_3 = 0,5 \text{ кН};$ $F_5 = 2,5 \text{ кН};$ $R_1 = 0,15 \text{ м};$ $R_2 = 0,18 \text{ м};$ $a = 0,1 \text{ м};$ $b = 0,12 \text{ м};$ $c = 0,3 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $Z_B = ?$ $F_4 = ?$

1	2	3	4
23		$F_1 = 7 \text{ кН};$ $F_2 = 2,8 \text{ кН};$ $F_3 = 0,8 \text{ кН};$ $F_5 = 4 \text{ кН};$ $R_1 = 0,07 \text{ м};$ $R_2 = 0,12 \text{ м};$ $a = 0,12 \text{ м};$ $b = 0,2 \text{ м};$ $c = 0,47 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $Z_B = ?$ $F_4 = ?$
24		$F_1 = 6 \text{ кН};$ $F_2 = 2 \text{ кН};$ $F_3 = 0,6 \text{ кН};$ $F_5 = 2,5 \text{ кН};$ $R_1 = 0,06 \text{ м};$ $R_2 = 0,16 \text{ м};$ $a = 0,2 \text{ м};$ $b = 0,25 \text{ м};$ $c = 0,55 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$
25		$F_1 = 11 \text{ кН};$ $F_2 = 4 \text{ кН};$ $F_3 = 2 \text{ кН};$ $F_5 = 5 \text{ кН};$ $R_1 = 0,1 \text{ м};$ $R_2 = 0,2 \text{ м};$ $a = 0,1 \text{ м};$ $b = 0,12 \text{ м};$ $c = 0,3 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $Z_B = ?$ $F_4 = ?$
26		$F_1 = 2 \text{ кН};$ $F_2 = 0,8 \text{ кН};$ $F_3 = 0,2 \text{ кН};$ $F_5 = 1 \text{ кН};$ $R_1 = 0,05 \text{ м};$ $R_2 = 0,12 \text{ м};$ $a = 0,14 \text{ м};$ $b = 0,11 \text{ м};$ $c = 0,45 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $Z_B = ?$ $F_4 = ?$

1	2	3	4
27		$F_1 = 8 \text{ кН};$ $F_2 = 3 \text{ кН};$ $F_3 = 1,2 \text{ кН};$ $F_5 = 3,6 \text{ кН};$ $R_1 = 0,06 \text{ м};$ $R_2 = 0,15 \text{ м};$ $a = 0,1 \text{ м};$ $b = 0,2 \text{ м};$ $c = 0,55 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $Z_B = ?$ $F_4 = ?$
28		$F_1 = 14 \text{ кН};$ $F_2 = 5 \text{ кН};$ $F_3 = 2 \text{ кН};$ $F_5 = 3 \text{ кН};$ $R_1 = 0,08 \text{ м};$ $R_2 = 0,12 \text{ м};$ $a = 0,12 \text{ м};$ $b = 0,24 \text{ м};$ $c = 0,5 \text{ м}$	$X_A = ?$ $Z_A = ?$ $X_B = ?$ $Y_B = ?$ $Z_B = ?$ $F_4 = ?$
29		$F_1 = 12 \text{ кН};$ $F_2 = 4 \text{ кН};$ $F_3 = 1 \text{ кН};$ $F_5 = 4,8 \text{ кН};$ $R_1 = 0,1 \text{ м};$ $R_2 = 0,25 \text{ м};$ $a = 0,12 \text{ м};$ $b = 0,18 \text{ м};$ $c = 0,8 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$
30		$F_1 = 5 \text{ кН};$ $F_2 = 2 \text{ кН};$ $F_3 = 0,5 \text{ кН};$ $F_5 = 1 \text{ кН};$ $R_1 = 0,12 \text{ м};$ $R_2 = 0,25 \text{ м};$ $a = 0,15 \text{ м};$ $b = 0,2 \text{ м};$ $c = 0,45 \text{ м}$	$X_A = ?$ $Y_A = ?$ $Z_A = ?$ $X_B = ?$ $Z_B = ?$ $F_4 = ?$