

Сферическое движение. Динамические уравнения Эйлера

Движение твердого тела, закрепленного шарнирно в начале координат, задано углами Эйлера. Найти модуль главного момента, приложенного к телу, при $t = 0$. Заданы главные моменты инерции тела (кгм²).

Литература. *Тарг С.М.* Краткий курс теоретической механики. - М.: Высш.шк., 1998, с. 150, 342.

Задача D37.1.

4

$$\varphi = t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 2, \quad J_y = 4, \quad J_z = 5.$$

Задача D37.2.

4

$$\varphi = 4t^2 + \pi/4, \quad \psi = 2t, \quad \theta = 4t + \pi/6, \\ J_x = 3, \quad J_y = 5, \quad J_z = 4.$$

Задача D37.3.

4

$$\varphi = t^2 + \pi/4, \quad \psi = 4t, \quad \theta = 2t + \pi/6, \\ J_x = 4, \quad J_y = 2, \quad J_z = 5.$$

Задача D37.4.

4

$$\varphi = 2t + \pi/3, \quad \psi = 2t^2, \quad \theta = 4t + \pi/2, \\ J_x = 3, \quad J_y = 1, \quad J_z = 3.$$

Задача D37.5.

4

$$\varphi = 2t + \pi/6, \quad \psi = 2t, \quad \theta = 3t + \pi/3, \\ J_x = 5, \quad J_y = 3, \quad J_z = 5.$$

Задача D37.6.

4

$$\varphi = 2t^2 + \pi/4, \quad \psi = 4t, \quad \theta = 3t + \pi/6, \\ J_x = 3, \quad J_y = 5, \quad J_z = 4.$$

Задача D37.7.

4

$$\varphi = 2t + \pi/3, \quad \psi = 4t^2, \quad \theta = 4t + \pi/2, \\ J_x = 1, \quad J_y = 3, \quad J_z = 3.$$

Задача D37.8.

4

$$\varphi = 2t^2 + \pi/4, \quad \psi = 4t, \quad \theta = t + \pi/6, \\ J_x = 6, \quad J_y = 4, \quad J_z = 4.$$

Задача D37.9.

4

$$\varphi = 2t^2 + \pi/4, \quad \psi = 4t, \quad \theta = 3t + \pi/6, \\ J_x = 3, \quad J_y = 5, \quad J_z = 4.$$

Задача D37.10.

4

$$\varphi = 3t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 2, \quad J_y = 1, \quad J_z = 2.$$

Задача D37.11.

4

$$\varphi = 4t^2 + \pi/4, \quad \psi = 2t, \quad \theta = 3t + \pi/6, \\ J_x = 3, \quad J_y = 5, \quad J_z = 5.$$

Задача D37.12.

4

$$\varphi = t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 2, \quad J_y = 6, \quad J_z = 5.$$

Задача D37.13.

4

$$\varphi = 2t + \pi/3, \quad \psi = 2t^2, \quad \theta = 4t + \pi/2, \\ J_x = 4, \quad J_y = 5, \quad J_z = 2.$$

Задача D37.14.

4

$$\varphi = t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 2, \quad J_y = 5, \quad J_z = 4.$$

Задача D37.15.

4

$$\varphi = 2t^2 + \pi/4, \quad \psi = 4t, \quad \theta = 3t + \pi/6, \\ J_x = 3, \quad J_y = 5, \quad J_z = 4.$$

Задача D37.16.

4

$$\varphi = 2t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 5, \quad J_y = 6, \quad J_z = 4.$$

Задача D37.17.

4

$$\varphi = 2t + \pi/3, \quad \psi = 2t^2, \quad \theta = 4t + \pi/2, \\ J_x = 5, \quad J_y = 3, \quad J_z = 4.$$

Задача D37.18.

4

$$\varphi = t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 2, \quad J_y = 6, \quad J_z = 5.$$

Задача D37.19.

4

$$\varphi = 4t^2 + \pi/4, \quad \psi = 2t, \quad \theta = 3t + \pi/6, \\ J_x = 3, \quad J_y = 5, \quad J_z = 5.$$

Задача D37.20.

4

$$\varphi = 3t^2 + \pi/4, \quad \psi = 4t, \quad \theta = 4t + \pi/6, \\ J_x = 5, \quad J_y = 1, \quad J_z = 5.$$

Задача D37.21.

4

$$\varphi = 2t + \pi/3, \quad \psi = 4t^2, \quad \theta = 4t + \pi/2, \\ J_x = 5, \quad J_y = 3, \quad J_z = 3.$$

Задача D37.22.

4

$$\varphi = 3t + \pi/6, \quad \psi = 2t, \quad \theta = t + \pi/3, \\ J_x = 2, \quad J_y = 4, \quad J_z = 5.$$

Задача D37.23.

4

$$\varphi = 2t + \pi/3, \quad \psi = 3t^2, \quad \theta = 2t + \pi/2, \\ J_x = 4, \quad J_y = 2, \quad J_z = 4.$$

Задача D37.24.

4

$$\varphi = 2t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 5, \quad J_y = 4, \quad J_z = 5.$$

Задача D37.25.

4

$$\varphi = 2t + \pi/3, \quad \psi = 4t^2, \quad \theta = 4t + \pi/2, \\ J_x = 1, \quad J_y = 3, \quad J_z = 3.$$

Задача D37.26.

4

$$\varphi = 2t + \pi/3, \quad \psi = 3t^2, \quad \theta = 2t + \pi/2, \\ J_x = 2, \quad J_y = 1, \quad J_z = 2.$$

Задача D37.27.

4

$$\varphi = 2t + \pi/3, \quad \psi = 4t^2, \quad \theta = 4t + \pi/2, \\ J_x = 5, \quad J_y = 3, \quad J_z = 4.$$

Задача D37.28.

4

$$\varphi = t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 2, \quad J_y = 6, \quad J_z = 5.$$

Задача D37.29.

4

$$\varphi = 2t + \pi/3, \quad \psi = 3t^2, \quad \theta = 2t + \pi/2, \\ J_x = 4, \quad J_y = 2, \quad J_z = 4.$$

Задача D37.30.

4

$$\varphi = t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3, \\ J_x = 2, \quad J_y = 4, \quad J_z = 5.$$

Задача D37.31.

4

$$\varphi = 3t + \pi/3, \quad \psi = 3t^2, \quad \theta = 2t + \pi/2, \\ J_x = 5, \quad J_y = 2, \quad J_z = 4.$$

Задача D37.32.

4

$$\varphi = 4t^2 + \pi/4, \quad \psi = 2t, \quad \theta = 3t + \pi/6, \\ J_x = 3, \quad J_y = 5, \quad J_z = 5.$$

Задача D37.33.

4

$$\varphi = t + \pi/6, \quad \psi = 4t, \quad \theta = 2t + \pi/3,$$

$$J_x = 2, \quad J_y = 6, \quad J_z = 5.$$

Задача D37.34.

4

$$\varphi = 2t^2 + \pi/4, \quad \psi = 2t, \quad \theta = 4t + \pi/6,$$

$$J_x = 3, \quad J_y = 5, \quad J_z = 4.$$

D37 Ответы.**Сферическое движение. Динамические уравнения Эйлера**

17.09.2012

№	ω_x	ω_y	ω_z	M_x	M_y	M_z	M_0
1	3.464	2.000	3.000	14.000	-31.177	-20.785	40.000
2	3.536	-2.121	1.732	18.371	18.371	1.000	26.000
3	2.828	0.000	3.464	19.596	0.000	-10.000	22.000
4	2.000	-3.464	2.000	-24.249	-2.000	13.856	28.000
5	3.464	-0.000	3.000	7.500	-12.990	-25.981	30.000
6	3.536	-0.707	3.464	24.495	24.495	-13.000	37.000
7	2.000	-3.464	2.000	0.000	-8.000	-13.856	16.000
8	2.121	0.707	3.464	14.697	24.495	5.000	29.000
9	3.536	-0.707	3.464	24.495	24.495	-13.000	37.000
10	3.464	2.000	5.000	26.000	-6.928	-20.785	34.000
11	2.828	-1.414	1.732	11.023	8.573	17.000	22.000
12	3.464	2.000	3.000	2.000	-31.177	-6.928	32.000
13	2.000	-3.464	2.000	6.928	-2.000	-6.928	10.000
14	3.464	2.000	3.000	2.000	-20.785	-6.928	22.000
15	3.536	-0.707	3.464	24.495	24.495	-13.000	37.000
16	3.464	2.000	4.000	14.000	-6.928	-20.785	26.000
17	2.000	-3.464	2.000	-24.249	-2.000	13.856	28.000
18	3.464	2.000	3.000	2.000	-31.177	-6.928	32.000
19	2.828	-1.414	1.732	11.023	8.573	17.000	22.000
20	4.243	-1.414	3.464	29.394	9.798	14.000	34.000
21	2.000	-3.464	2.000	0.000	8.000	13.856	16.000
22	1.732	1.000	4.000	11.000	-38.105	-5.196	40.000
23	1.000	-1.732	2.000	-0.000	2.000	3.464	4.000
24	3.464	2.000	4.000	38.000	-13.856	-41.569	58.000
25	2.000	-3.464	2.000	0.000	-8.000	-13.856	16.000
26	1.000	-1.732	2.000	-0.000	1.000	1.732	2.000
27	2.000	-3.464	2.000	-6.928	4.000	13.856	16.000
28	3.464	2.000	3.000	2.000	-31.177	-6.928	32.000
29	1.000	-1.732	2.000	-0.000	2.000	3.464	4.000
30	3.464	2.000	3.000	14.000	-31.177	-20.785	40.000
31	1.000	-1.732	3.000	-10.392	3.000	5.196	12.000
32	2.828	-1.414	1.732	11.023	8.573	17.000	22.000
33	3.464	2.000	3.000	2.000	-31.177	-6.928	32.000
34	3.536	-2.121	1.732	18.371	18.371	-15.000	30.000