http://cifra.studentmiv.ru/tau-1-1-zadanie/

Задание 1

Передаточная функция линейной САУ

Вывести формулу передаточной функции по заданному дифференциальному уравнению. Написать формулу характеристического уравнения.

Пример решения см. в учебном пособии (есть в библиотеке ЛГТУ):

Музылёва И. В. Теория автоматического управления. Линейные системы [Текст]: методические указания к практическим занятиям / И. В. Музылева, А. А. Муравьев. - Липецк: Изд-во ЛГТУ, 2013. - 79 с.

Варианты задания

№	Дифференциальное уравнение
1	$30\frac{d^4x_{вых}(t)}{dt^4}+25\frac{d^2x_{вых}(t)}{dt^2}-10\frac{dx_{вых}(t)}{dt}+10x_{вых}(t)=5\frac{dx_{вх}(t)}{dt}+x_{вх}(t)$
2	$9\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+3\frac{dx_{вых}(t)}{dt}+30x_{вых}(t)=9\frac{d^3x_{вх}(t)}{dt^3}-6\frac{dx_{вх}(t)}{dt}$
3	$14\frac{d^5x_{вых}(t)}{dt^5}+7\frac{d^2x_{вых}(t)}{dt^2}-14\frac{d}{dt}x_{вых}(t)+7x_{вых}(t)=7\frac{d^2x_{вх}(t)}{dt^2}$
4	$60\frac{d^4x_{вых}(t)}{dt^4}+16\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+4x_{вых}(t)=-4\frac{d^2x_{вх}(t)}{dt^2}+4x_{вх}(t)$
5	$15\frac{d^6x_{вых}(t)}{dt^6}-9\frac{d^3x_{вых}(t)}{dt^3}+12\frac{dx_{вых}(t)}{dt}+3x_{вых}(t)=6\frac{d^2x_{вх}(t)}{dt^2}$
6	$4\frac{d^4x_{вых}(t)}{dt^4}+8\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}=60\frac{d^2x_{вх}(t)}{dt^2}+12\frac{dx_{вх}(t)}{dt}$
7	$22\frac{d^4x_{вых}(t)}{dt^4}-33\frac{d^3x_{вых}(t)}{dt^3}+11\frac{d^2x_{вых}(t)}{dt^2}+x_{вых}(t)=44\frac{d^3x_{вх}(t)}{dt^3}+x_{вх}(t)$
8	$12\frac{d^5x_{вых}(t)}{dt^3}+6\frac{d^2x_{вых}(t)}{dt^2}-12\frac{dx_{вых}(t)}{dt}+12x_{вых}(t)=2\frac{d^4x_{вх}(t)}{dt^4}+4x_{вх}(t)$
9	$20\frac{d^3x_{вых}(t)}{dt^3}+16\frac{d^2x_{вых}(t)}{dt^2}-12\frac{dx_{вых}(t)}{dt}+4x_{вых}(t)=-\frac{d^3x_{вх}(t)}{dt^3}+4x_{вх}(t)$
10	$15\frac{d^5x_{вых}(t)}{dt^5}-90\frac{d^3x_{вых}(t)}{dt^3}+12\frac{dx_{вых}(t)}{dt}+30x_{вых}(t)=6\frac{dx_{вх}(t)}{dt}$

11	$40\frac{d^3x_{вых}(t)}{dt^3}+8\frac{d^2x_{вых}(t)}{dt^2}-10\frac{dx_{вых}(t)}{dt}=20\frac{d^4x_{вх}(t)}{dt^4}+2x_{вх}(t)$
12	$120\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+\frac{dx_{вых}(t)}{dt}+3x_{вых}(t)=\frac{d^4x_{вх}(t)}{dt^4}-60\frac{dx_{вх}(t)}{dt}$
13	$2{,}8\frac{d^5x_{вых}(t)}{dt^5}+70\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+7x_{вых}(t)=21\frac{dx_{вх}(t)}{dt}+1{,}4x_{вх}(t)$
14	$60\frac{d^3x_{вых}(t)}{dt^3}+4\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=2\frac{d^4x_{вх}(t)}{dt^4}+10\frac{d^2x_{вх}(t)}{dt^2}$
15	$30\frac{d^4}{dt^4}x_{вых}(t)+25\frac{d^2}{dt^2}x_{вых}(t)-10\frac{d}{dt}x_{вых}(t)+10x_{вых}(t)=x_{вх}(t)$
16	$3\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^3x_{вых}(t)}{dt^3}+\frac{d^2x_{вых}(t)}{dt^2}-9\frac{dx_{вых}(t)}{dt}+1{,}5x_{вых}(t)=3\frac{dx_{вх}(t)}{dt}$
17	$12\frac{d^3x_{вых}(t)}{dt^3}+6\frac{d^2x_{вых}(t)}{dt^2}+3\frac{dx_{вых}(t)}{dt}+9x_{вых}(t)=0{,}9\frac{d^2x_{вх}(t)}{dt^2}-3x_{вх}(t)$
18	$-33\frac{d^3x_{вых}(t)}{dt^3}+22\frac{d^2x_{вых}(t)}{dt^2}+11\frac{dx_{вых}(t)}{dt}=22\frac{dx_{вх}(t)}{dt}+11x_{вх}(t)$
19	$3\frac{d^4x_{вых}(t)}{dt^4}+9\frac{d^3x_{вых}(t)}{dt^3}+3\frac{d^2x_{вых}(t)}{dt^2}=6\frac{d^2x_{вх}(t)}{dt^2}-9x_{вх}(t)$
20	$3\frac{d^4x_{вых}(t)}{dt^4}+2\frac{d^3x_{вых}(t)}{dt^3}-\frac{dx_{вых}(t)}{dt}+10x_{вых}(t)=\frac{dx_{вх}(t)}{dt}x_{вх}(t)+10x_{вх}(t)$
21	$\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+\frac{dx_{вых}(t)}{dt}+30x_{вых}(t)=9\frac{d^3x_{вх}(t)}{dt^3}-6\frac{d}{dt}x_{вх}(t)$
22	$14\frac{d^5x_{вых}(t)}{dt^5}+7\frac{d^2x_{вых}(t)}{dt^2}-14\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=7\frac{d^2x_{вх}(t)}{dt^2}+\frac{dx_{вх}(t)}{dt}$
23	$8\frac{d^3x_{вых}(t)}{dt^3}+\frac{d^2x_{вых}(t)}{dt^2}-12\frac{dx_{вых}(t)}{dt}+4x_{вых}(t)=-4\frac{d^3x_{вх}(t)}{dt^3}+0{,}4x_{вх}(t)$
24	$1{,}5\frac{d^6x_{вых}(t)}{dt^6}-9\frac{d^3x_{вых}(t)}{dt^3}+1{,}2\frac{dx_{вых}(t)}{dt}+3x_{вых}(t)=0{,}6\frac{d^2x_{вх}(t)}{dt^2}$
25	$4\frac{d^4x_{вых}(t)}{dt^4}+0{,}8\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}=6\frac{d^2x_{вх}(t)}{dt^2}+0{,}2\frac{dx_{вх}(t)}{dt}$
26	$66\frac{d^5x_{вых}(t)}{dt^5}-33\frac{d^3x_{вых}(t)}{dt^3}+11\frac{dx_{вых}(t)}{dt}+22x_{вых}(t)=11x_{вх}(t)$
27	$12\frac{d^5x_{вых}(t)}{dt^3}+6\frac{d^2x_{вых}(t)}{dt^2}-12\frac{dx_{вых}(t)}{dt}+1{,}2x_{вых}(t)=2\frac{d^4x_{вх}(t)}{dt^4}+4x_{вх}(t)$
28	$2\frac{d^3x_{вых}(t)}{dt^3}-7\frac{d^2x_{вых}(t)}{dt^2}-9\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=8\frac{d^2x_{вх}(t)}{dt^2}x_{вх}(t)+x_{вх}(t)$
29	$3\frac{d^4x_{вых}(t)}{dt^4}+1{,}5\frac{d^3x_{вых}(t)}{dt^3}+5\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+10x_{вых}(t)=2x_{вх}(t)$

30	$30\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^3x_{вых}(t)}{dt^3}+3\frac{d^2x_{вых}(t)}{dt^2}-9\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=3\frac{dx_{вх}(t)}{dt}$
31	$1,2\frac{d^3x_{вых}(t)}{dt^3}+6\frac{d^2x_{вых}(t)}{dt^2}+3,6\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=9\frac{d^2x_{вх}(t)}{dt^2}-3x_{вх}(t)$
32	$-3,3\frac{d^4x_{вых}(t)}{dt^4}+2,2\frac{d^2x_{вых}(t)}{dt^2}+1,1\frac{dx_{вых}(t)}{dt}=2,2\frac{dx_{вх}(t)}{dt}+11x_{вх}(t)$
33	$3\frac{d^6x_{вых}(t)}{dt^6}+0,9\frac{d^3x_{вых}(t)}{dt^3}+0,3\frac{d^2x_{вых}(t)}{dt^2}=0,6\frac{d^2x_{вх}(t)}{dt^2}-0,3x_{вх}(t)$
34	$50\frac{d^4x_{вых}(t)}{dt^4}+25\frac{d^3x_{вых}(t)}{dt^3}-\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=5\frac{dx_{вх}(t)}{dt}x_{вх}(t)+x_{вх}(t)$
35	$\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+1,2\frac{dx_{вых}(t)}{dt}+3x_{вых}(t)=9\frac{d^3x_{вх}(t)}{dt^3}-6x_{вх}(t)$
36	$4\frac{d^5x_{вых}(t)}{dt^5}+\frac{d^2x_{вых}(t)}{dt^2}-14\frac{d}{dt}x_{вых}(t)+x_{вых}(t)=7\frac{d^2x_{вх}(t)}{dt^2}+21\frac{dx_{вх}(t)}{dt}$
37	$3\frac{d^4x_{вых}(t)}{dt^4}-1,5\frac{d^3x_{вых}(t)}{dt^3}+2,5\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=2x_{вх}(t)$
38	$30\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^3x_{вых}(t)}{dt^3}+3\frac{d^2x_{вых}(t)}{dt^2}-9\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=3\frac{dx_{вх}(t)}{dt}$
39	$18\frac{d^3x_{вых}(t)}{dt^3}+6\frac{d^2x_{вых}(t)}{dt^2}+3,6\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=5\frac{d^2x_{вх}(t)}{dt^2}-3,6x_{вх}(t)$
40	$-3,3\frac{d^4x_{вых}(t)}{dt^4}+2,2\frac{d^3x_{вых}(t)}{dt^3}+1,1\frac{dx_{вых}(t)}{dt}=2,2\frac{dx_{вх}(t)}{dt}$
41	$30\frac{d^6x_{вых}(t)}{dt^6}-0,9\frac{d^3x_{вых}(t)}{dt^3}+0,3\frac{d^2x_{вых}(t)}{dt^2}=6\frac{d^2x_{вх}(t)}{dt^2}-0,3x_{вх}(t)$
42	$5\frac{d^4x_{вых}(t)}{dt^4}+25\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+5x_{вых}(t)=5\frac{dx_{вх}(t)}{dt}x_{вх}(t)+x_{вх}(t)$
43	$\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+1,2\frac{dx_{вых}(t)}{dt}+3x_{вых}(t)=9\frac{d^2x_{вх}(t)}{dt^2}-6x_{вх}(t)$
44	$3\frac{d^6x_{вых}(t)}{dt^6}-0,9\frac{d^4x_{вых}(t)}{dt^4}+0,3\frac{d^2x_{вых}(t)}{dt^2}=0,6\frac{d^2x_{вх}(t)}{dt^2}-0,3x_{вх}(t)$
45	$50\frac{d^4x_{вых}(t)}{dt^4}+25\frac{d^2x_{вых}(t)}{dt^2}-5\frac{dx_{вых}(t)}{dt}+10x_{вых}(t)=5\frac{dx_{вх}(t)}{dt}+x_{вх}(t)$
46	$5\frac{d^5x_{вых}(t)}{dt^5}-33\frac{d^3x_{вых}(t)}{dt^3}+1,1\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=44\frac{d^3x_{вх}(t)}{dt^3}+11x_{вх}(t)$
47	$12\frac{d^5x_{вых}(t)}{dt^3}+6\frac{d^2x_{вых}(t)}{dt^2}-12\frac{dx_{вых}(t)}{dt}+1,2x_{вых}(t)=\frac{d^4x_{вх}(t)}{dt^4}+x_{вх}(t)$
48	$2\frac{d^3x_{вых}(t)}{dt^3}-\frac{d^2x_{вых}(t)}{dt^2}-9\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=-\frac{d^2x_{вх}(t)}{dt^2}x_{вх}(t)+4x_{вх}(t)$

49	$30\frac{d^5x_{вых}(t)}{dt^5}+1,5\frac{d^3x_{вых}(t)}{dt^3}+25\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=2x_{вх}(t)$
50	$30\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^3x_{вых}(t)}{dt^3}+3\frac{d^2x_{вых}(t)}{dt^2}-9\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=3\frac{dx_{вх}(t)}{dt}$
51	$9\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+36\frac{dx_{вых}(t)}{dt}+0,9x_{вых}(t)=9\frac{d^2x_{вх}(t)}{dt^2}-3x_{вх}(t)$
52	$-33\frac{d^3x_{вых}(t)}{dt^3}+22\frac{d^2x_{вых}(t)}{dt^2}+11\frac{dx_{вых}(t)}{dt}=77\frac{dx_{вх}(t)}{dt}+11x_{вх}(t)$
53	$0,3\frac{d^6x_{вых}(t)}{dt^6}+9\frac{d^3x_{вых}(t)}{dt^3}+0,3\frac{d^2x_{вых}(t)}{dt^2}=6\frac{d^2x_{вх}(t)}{dt^2}-0,3x_{вх}(t)$
54	$5\frac{d^4x_{вых}(t)}{dt^4}+250\frac{d^3x_{вых}(t)}{dt^3}-\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=5\frac{dx_{вх}(t)}{dt}x_{вх}(t)+x_{вх}(t)$
55	$12\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+12\frac{dx_{вых}(t)}{dt}+3x_{вых}(t)=24\frac{d^3x_{вх}(t)}{dt^3}-6x_{вх}(t)$
56	$1,4\frac{d^5x_{вых}(t)}{dt^5}+7\frac{d^2x_{вых}(t)}{dt^2}-14\frac{d}{dt}x_{вых}(t)+7x_{вых}(t)=-2,1\frac{dx_{вх}(t)}{dt}$
57	$3\frac{d^4x_{вых}(t)}{dt^4}-1,5\frac{d^3x_{вых}(t)}{dt^3}+5\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+100x_{вых}(t)=2x_{вх}(t)$
58	$\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^3x_{вых}(t)}{dt^3}+3\frac{d^2x_{вых}(t)}{dt^2}-9\frac{dx_{вых}(t)}{dt}+12x_{вых}(t)=3\frac{dx_{вх}(t)}{dt}$
59	$18\frac{d^3x_{вых}(t)}{dt^3}+\frac{d^2x_{вых}(t)}{dt^2}+3,6\frac{dx_{вых}(t)}{dt}+x_{вых}(t)=9\frac{d^2x_{вх}(t)}{dt^2}-3,6x_{вх}(t)$
60	$-3,3\frac{d^4x_{вых}(t)}{dt^4}+2,2\frac{d^3x_{вых}(t)}{dt^3}+1,1\frac{dx_{вых}(t)}{dt}=2,2\frac{dx_{вх}(t)}{dt}+x_{вх}(t)$
61	$30\frac{d^6x_{вых}(t)}{dt^6}-0,9\frac{d^3x_{вых}(t)}{dt^3}+0,3\frac{d^2x_{вых}(t)}{dt^2}=6\frac{d^2x_{вх}(t)}{dt^2}-0,3x_{вх}(t)$
62	$\frac{d^4x_{вых}(t)}{dt^4}+25\frac{d^2x_{вых}(t)}{dt^2}-\frac{dx_{вых}(t)}{dt}+10x_{вых}(t)=5\frac{dx_{вх}(t)}{dt}x_{вх}(t)+x_{вх}(t)$
63	$3\frac{d^4x_{вых}(t)}{dt^4}+6\frac{d^2x_{вых}(t)}{dt^2}+1,2\frac{dx_{вых}(t)}{dt}+3x_{вых}(t)=9\frac{d^2x_{вх}(t)}{dt^2}-0,6x_{вх}(t)$
64	$30\frac{d^6x_{вых}(t)}{dt^6}-0,9\frac{d^4x_{вых}(t)}{dt^4}+0,03\frac{d^2x_{вых}(t)}{dt^2}=0,6\frac{d^2x_{вх}(t)}{dt^2}-0,03x_{вх}(t)$
65	$5\frac{d^4x_{вых}(t)}{dt^4}+2,5\frac{d^2x_{вых}(t)}{dt^2}-50\frac{dx_{вых}(t)}{dt}+10x_{вых}(t)=5\frac{dx_{вх}(t)}{dt}+5x_{вх}(t)$