

TEMAT ZADANIA Z KURSU *DYNAMIKA BUDOWLI*

„ROZWIĄZANIE ZAGADNIENIA WŁASNEGO DYSKRETNEGO UKŁADU DYNAMICZNEGO”

dla.....

Dla zadanego schematu dynamicznego przyjąć na podstawie statycznego działania mas przekrój, jednakowy dla wszystkich prętów, składający się z dwóch kształtowników walcowanych (ceowniki). Następnie sformułować macierzowe równanie ruchu, zadanego układu dynamicznego i przedstawić je w postaci symbolicznej. Zaprezentować równanie drgań własnych i rozwiązać zagadnienie własne – rezultaty podać liczbowo po podstawieniu stosownych wartości. Sporządzić rysunki form własnych układu.

Opracowanie powinno zawierać:

- wszystkie niezbędne do wykonania obliczeń schematy statyczne, dynamiczne, a także szkice, itp.,
- dobór współrzędnych uogólnionych i sformułowanie macierzowego równania ruchu,
- rozwiązanie zagadnienia statycznego i dobór kształtowników walcowanych,
- rozwiązanie zagadnienia własnego, w tym wyznaczenie częstości i wektorów własnych, rysunki form własnych.

Do sformułowania macierzowego równania ruchu należy zastosować metodę przemieszczeń lub sił (dowolnie). W obliczeniach należy **pomiąć masę własną konstrukcji**. Do obliczeń należy przyjąć następujące dane liczbowe:

- wytrzymałość obliczeniowa $f_d = 215$ MPa, moduł sprężystości $E = 205$ GPa
- współczynnik obciążenia $\gamma_f = 1,2$,
- przyspieszenie ziemskie $g = 9,81$ m/s².

Termin oddania **22.06.2025 r.**, prowadzący dr inż. Krzysztof Majcher

Numer albumu przypisany jest do tematu zgodnie z poniższą tabelą.

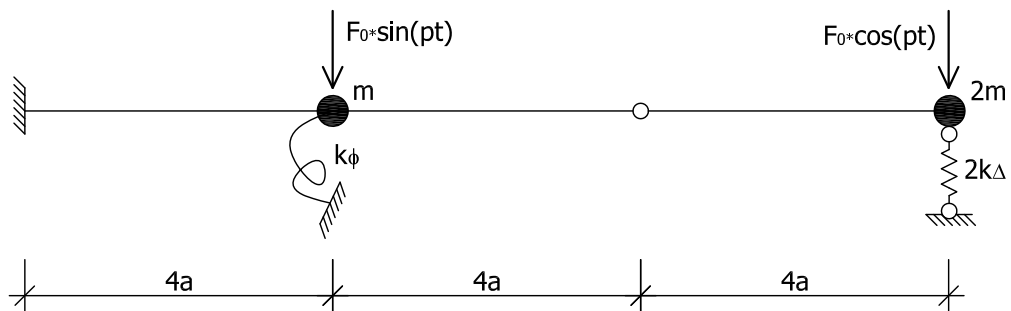
Numer tematu	Numer Albumu
1	264882
2	216901
3	258272
4	288592
5	265048
6	258228
7	264916
8	248477
9	187442
10	248458
11	264788
12	288673
13	234269
14	288654
15	248282
16	253935
17	258444
18	265277
19	258241
20	264839
21	208919
22	264927
23	265248
24	219834
25	258426
26	265009

Numer tematu	Numer Albumu
27	251938
28	288652
29	190871
30	248192
31	264870
32	265058
33	264811
34	258280
35	225072
36	227921
37	265066
38	262367
39	264955
40	264972
41	258451
42	253823
43	265015
44	258361
45	264880
46	252094
47	264976
48	257990
49	288653
50	258462
51	288682
52	258329
53	258227
54	264822
55	258468

1

$$a = 1,0 \text{ m}, F_0 = 3 \text{ kN}, m = 1500 \text{ kg},$$

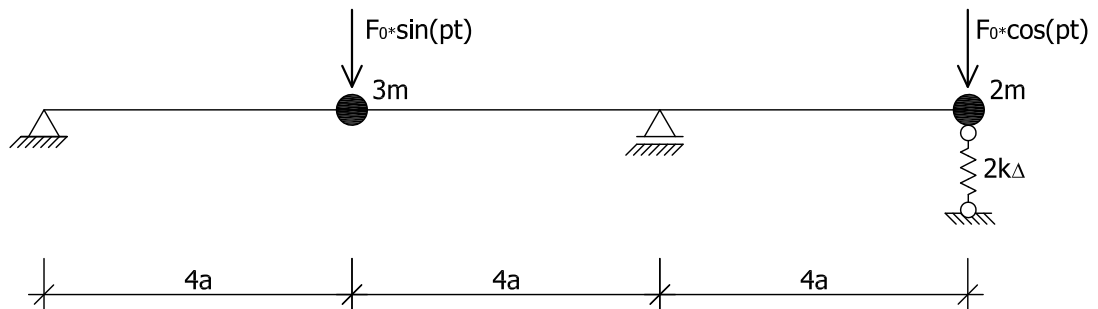
$$k_{\Delta} = 4EJ/3a^3, k_{\phi} = 2EJ/3a$$



2

$$a = 1,0 \text{ m}, F_0 = 3 \text{ kN}, m = 1500 \text{ kg},$$

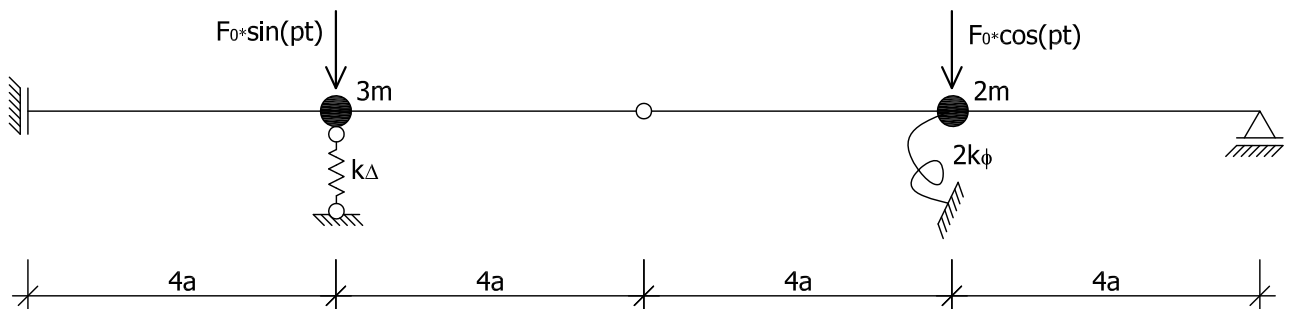
$$k_{\Delta} = EJ/3a^3$$



3

$$a = 1,2 \text{ m}, F_0 = 2,5 \text{ kN}, m = 2200 \text{ kg},$$

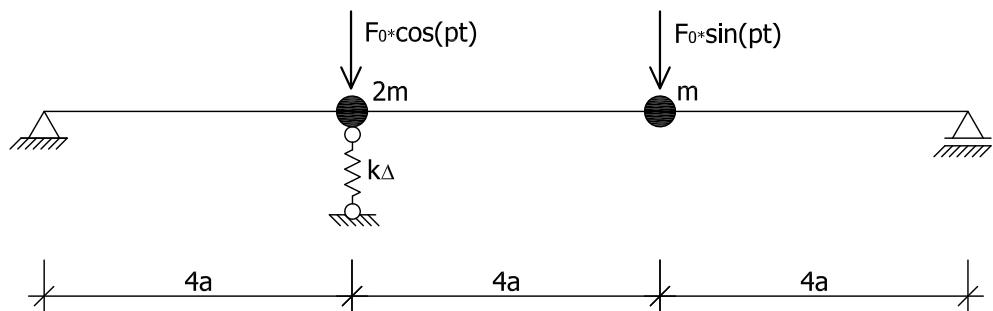
$$k_{\Delta} = 5EJ/3a^3, k_{\phi} = 4EJ/3a$$



4

$$a = 1,0 \text{ m}, F_0 = 3,5 \text{ kN}, m = 2000 \text{ kg},$$

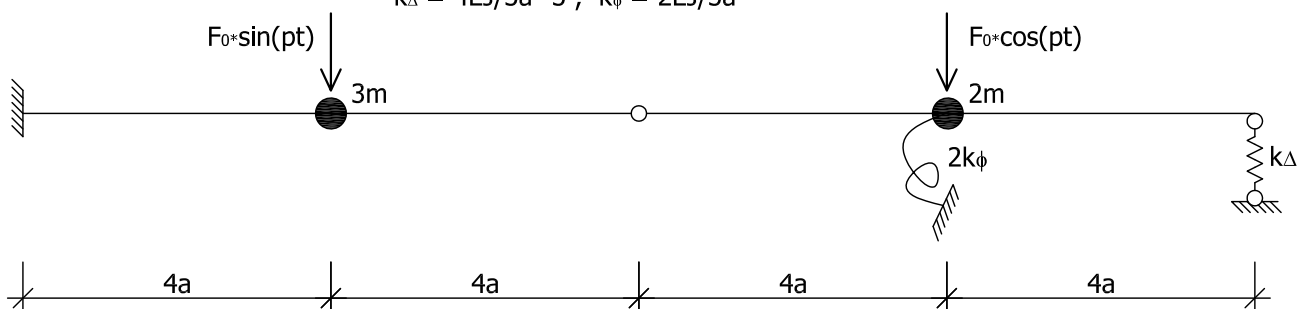
$$k_{\Delta} = 4EJ/3a^3$$



5

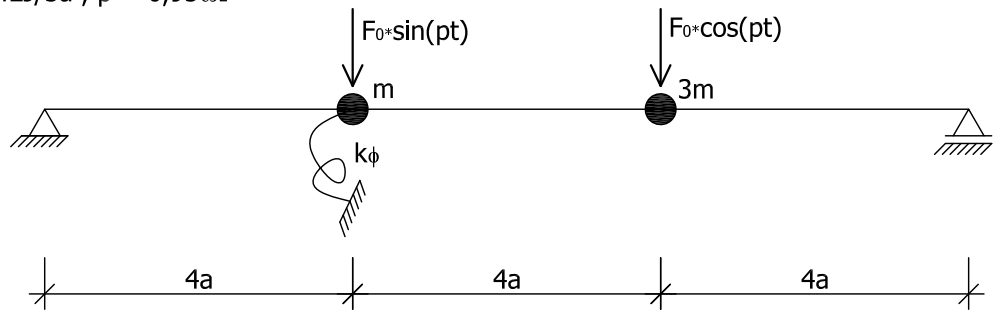
$$a = 1,0 \text{ m}, F_0 = 1,5 \text{ kN}, m = 1300 \text{ kg},$$

$$k_{\Delta} = 4EJ/3a^3, k_{\phi} = 2EJ/3a$$



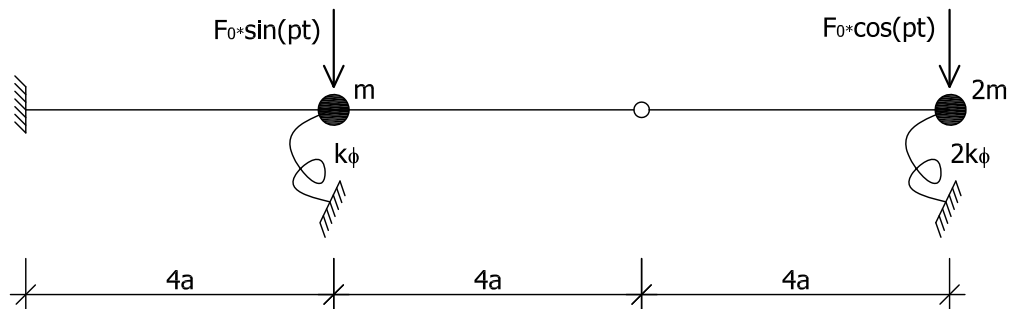
6

$a = 1,0 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 2000 \text{ kg}$,
 $k_\phi = 4EJ/3a$, $p = 0,95\omega_2$



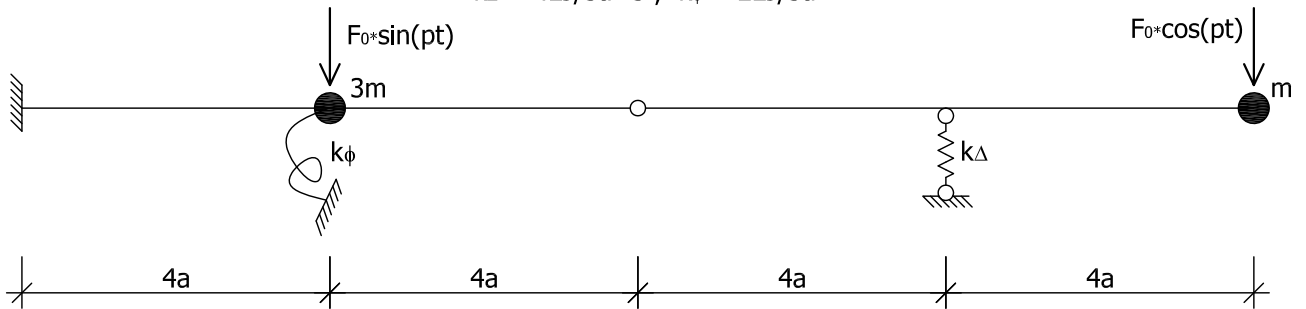
7

$a = 1,0 \text{ m}$, $F_0 = 3 \text{ kN}$, $m = 1500 \text{ kg}$,
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 2EJ/3a$



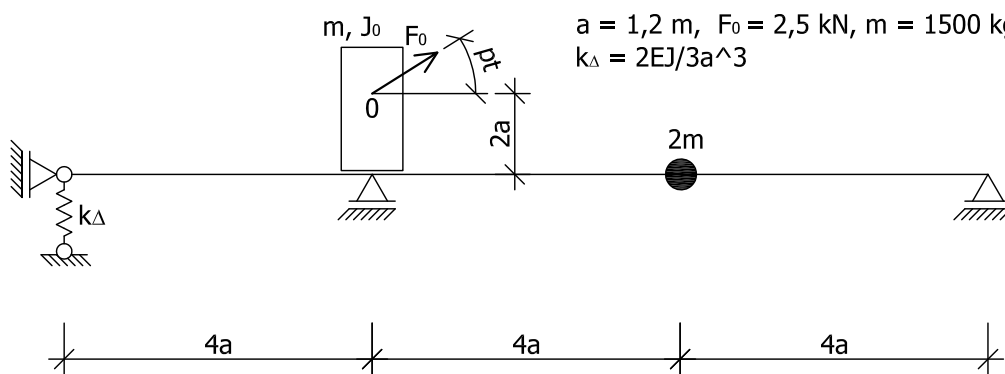
8

$a = 0,8 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 2200 \text{ kg}$,
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 2EJ/3a$



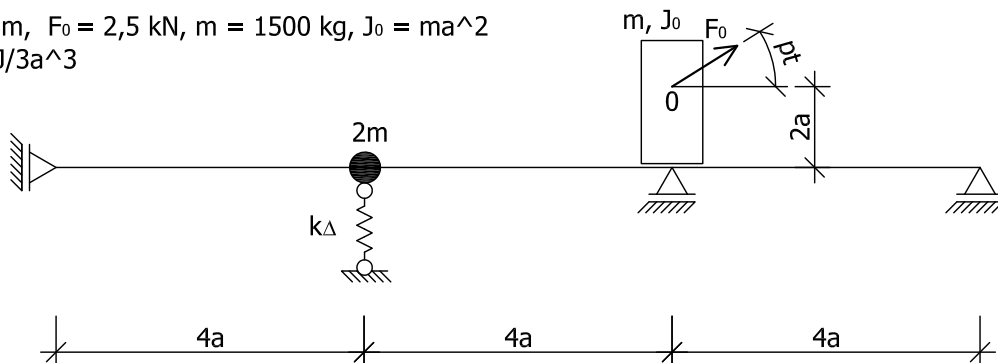
9

$a = 1,2 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = 0,5ma^2$,
 $k_\Delta = 2EJ/3a^3$



10

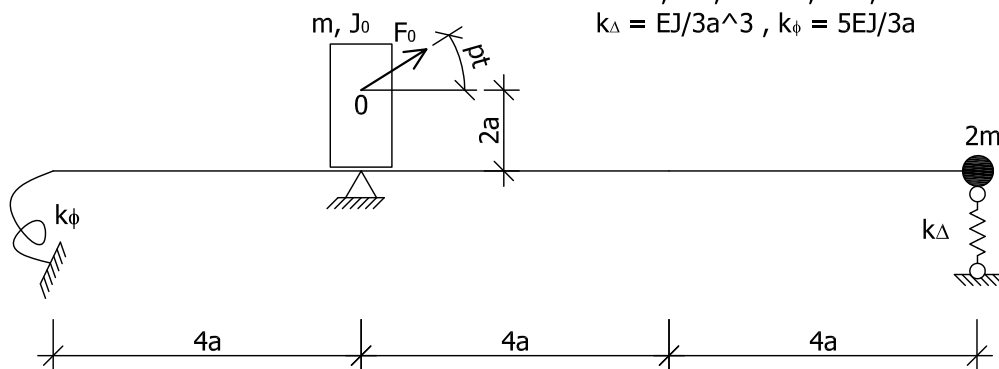
$a = 1,2 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = ma^2$,
 $k_\Delta = 4EJ/3a^3$



11

$$a = 1,0 \text{ m}, F_0 = 3,2 \text{ kN}, m = 1500 \text{ kg}, J_0 = ma^2$$

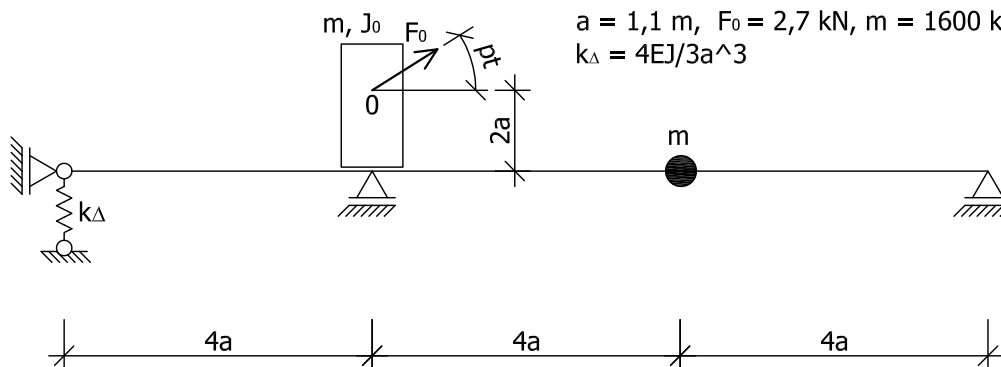
$$k_\Delta = EJ/3a^3, k_\phi = 5EJ/3a$$



12

$$a = 1,1 \text{ m}, F_0 = 2,7 \text{ kN}, m = 1600 \text{ kg}, J_0 = 0,5ma^2$$

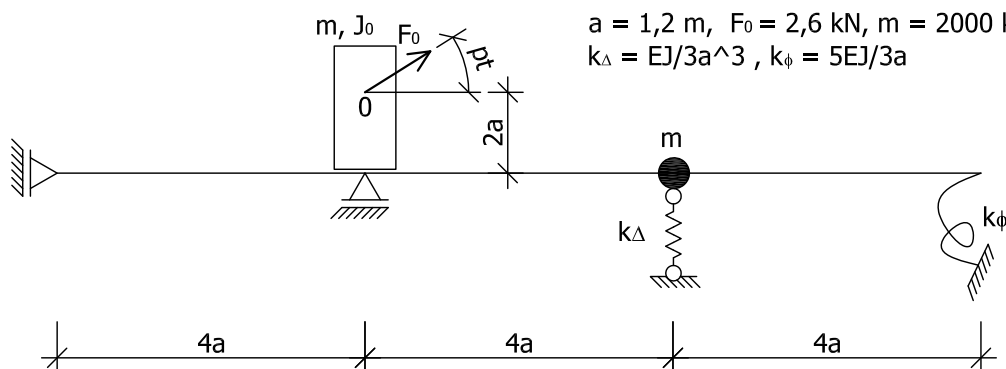
$$k_\Delta = 4EJ/3a^3$$



13

$$a = 1,2 \text{ m}, F_0 = 2,6 \text{ kN}, m = 2000 \text{ kg}, J_0 = 0,5ma^2$$

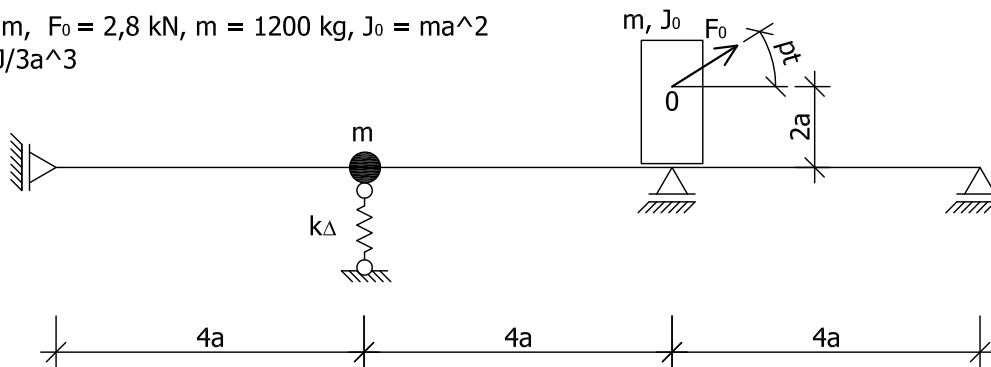
$$k_\Delta = EJ/3a^3, k_\phi = 5EJ/3a$$



14

$$a = 1,1 \text{ m}, F_0 = 2,8 \text{ kN}, m = 1200 \text{ kg}, J_0 = ma^2$$

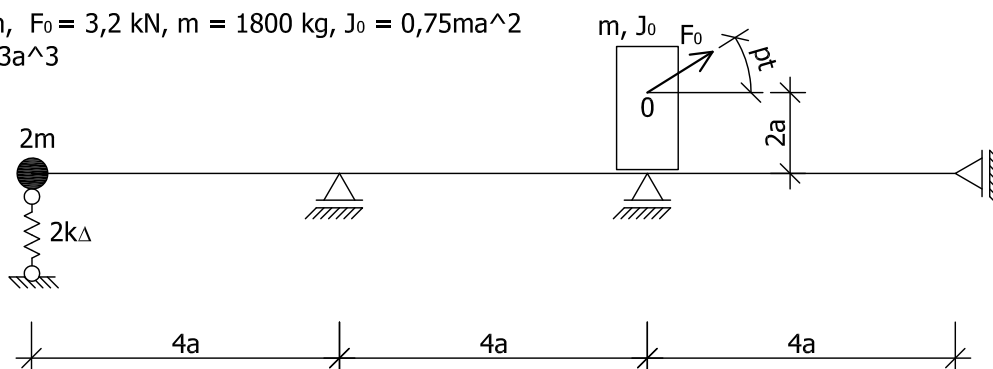
$$k_\Delta = 8EJ/3a^3$$



15

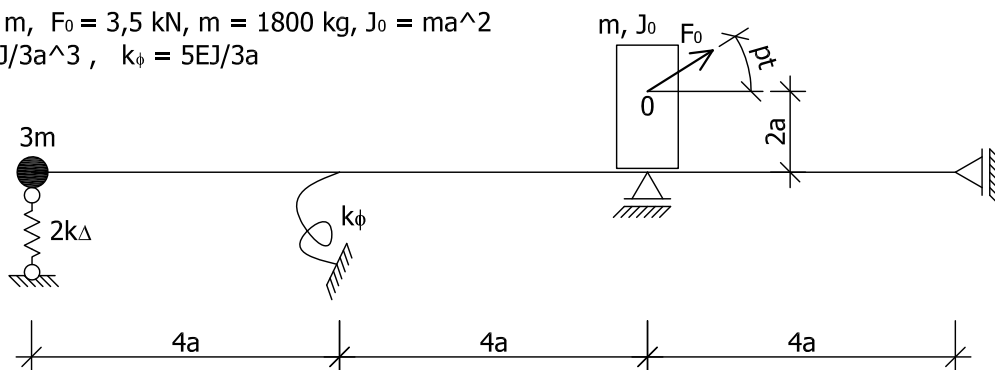
$$a = 1,0 \text{ m}, F_0 = 3,2 \text{ kN}, m = 1800 \text{ kg}, J_0 = 0,75ma^2$$

$$k_\Delta = 5EJ/3a^3$$



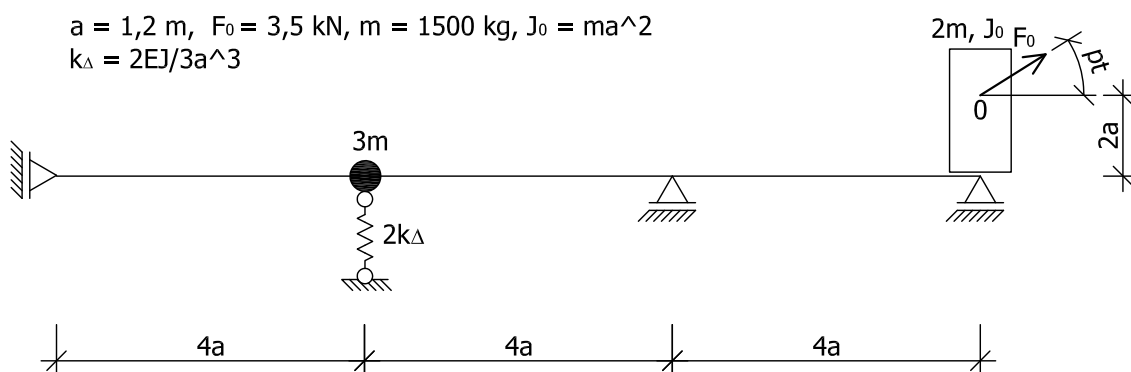
16

$a = 1,0 \text{ m}$, $F_0 = 3,5 \text{ kN}$, $m = 1800 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 5EJ/3a$



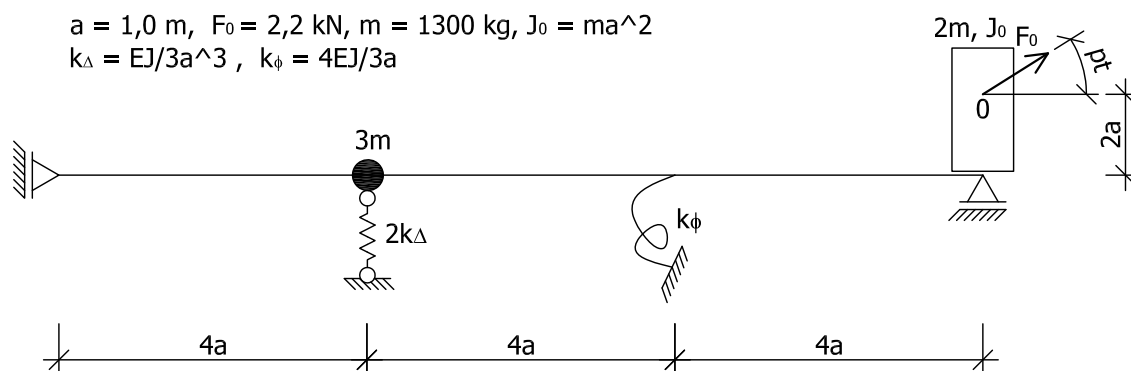
17

$a = 1,2 \text{ m}$, $F_0 = 3,5 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 2EJ/3a^3$



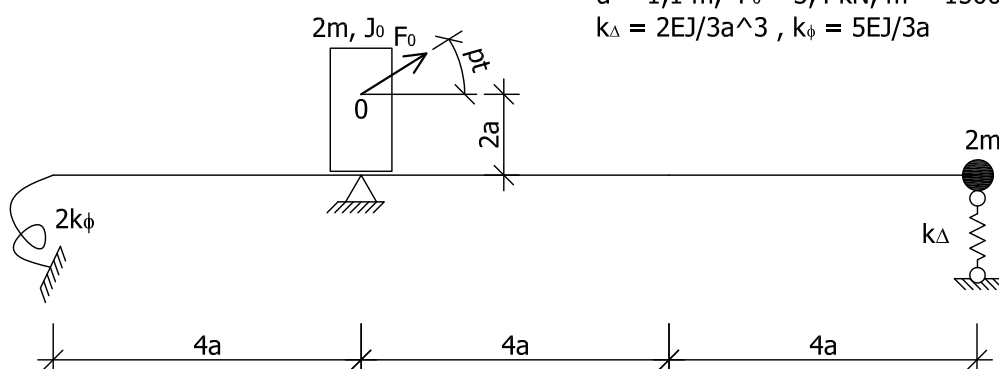
18

$a = 1,0 \text{ m}$, $F_0 = 2,2 \text{ kN}$, $m = 1300 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = EJ/3a^3$, $k_\phi = 4EJ/3a$



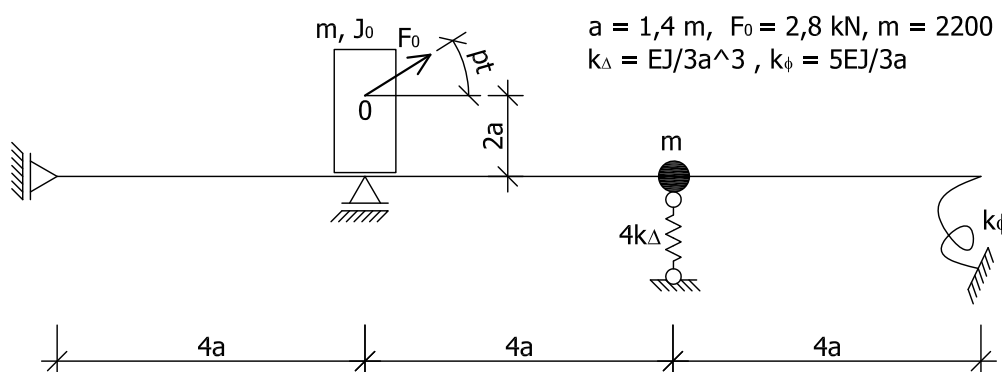
19

$a = 1,1 \text{ m}$, $F_0 = 3,4 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 2EJ/3a^3$, $k_\phi = 5EJ/3a$



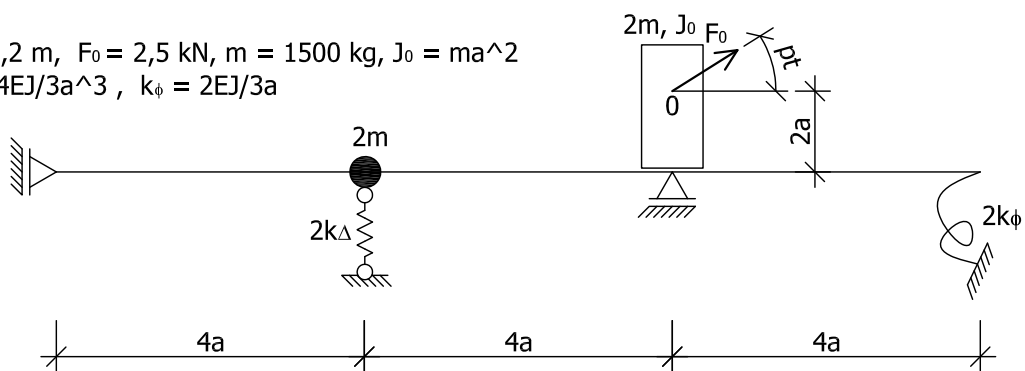
20

$a = 1,4 \text{ m}$, $F_0 = 2,8 \text{ kN}$, $m = 2200 \text{ kg}$, $J_0 = 0,5ma^2$
 $k_\Delta = EJ/3a^3$, $k_\phi = 5EJ/3a$



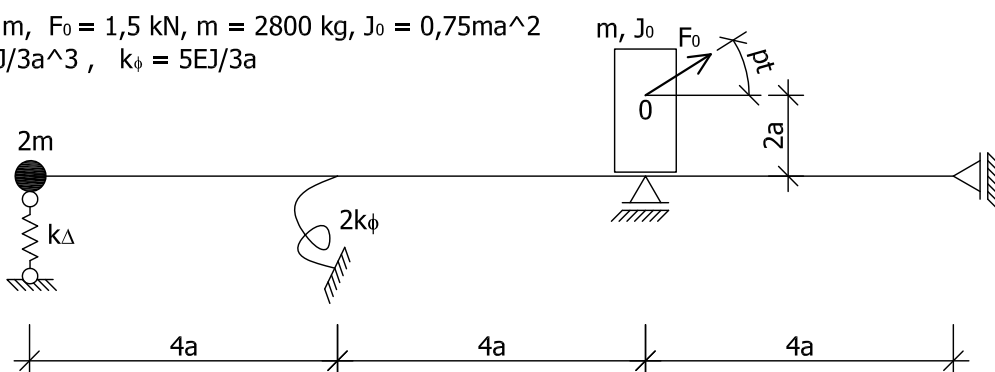
21

$a = 1,2 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 2EJ/3a$



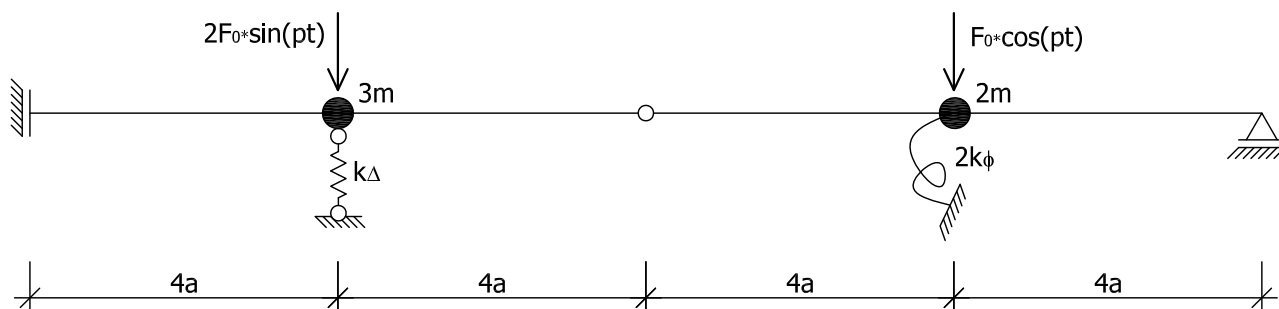
22

$a = 0,9 \text{ m}$, $F_0 = 1,5 \text{ kN}$, $m = 2800 \text{ kg}$, $J_0 = 0,75ma^2$
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 5EJ/3a$



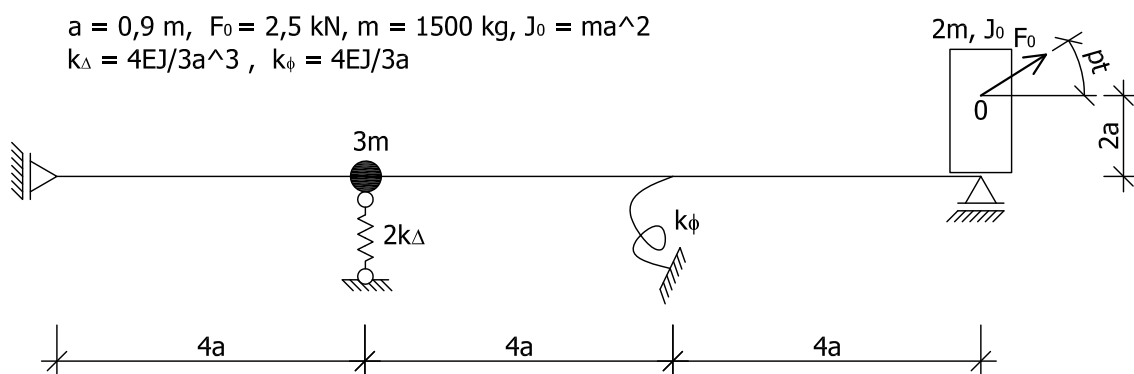
23

$a = 1,2 \text{ m}$, $F_0 = 3,5 \text{ kN}$, $m = 2400 \text{ kg}$,
 $k_\Delta = 5EJ/3a^3$, $k_\phi = 2EJ/3a$



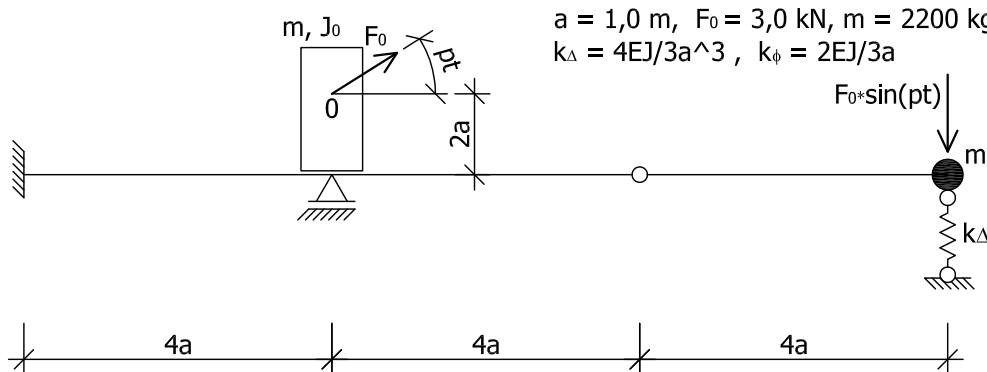
24

$a = 0,9 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 4EJ/3a$



25

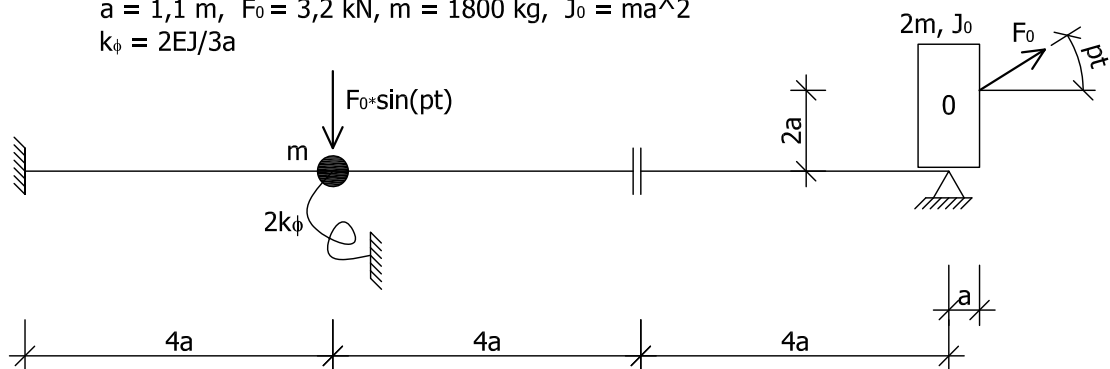
$a = 1,0 \text{ m}$, $F_0 = 3,0 \text{ kN}$, $m = 2200 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 2EJ/3a$



26

$$a = 1,1 \text{ m}, F_0 = 3,2 \text{ kN}, m = 1800 \text{ kg}, J_0 = ma^2$$

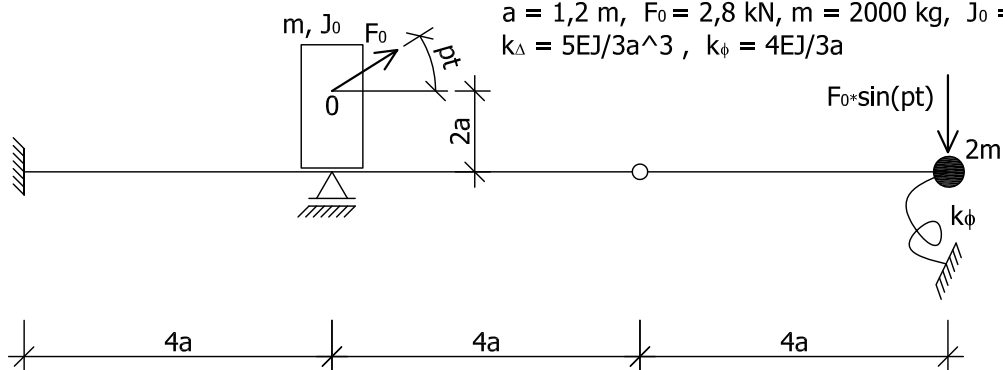
$$k_\phi = 2EJ/3a$$



27

$$a = 1,2 \text{ m}, F_0 = 2,8 \text{ kN}, m = 2000 \text{ kg}, J_0 = 0,75ma^2$$

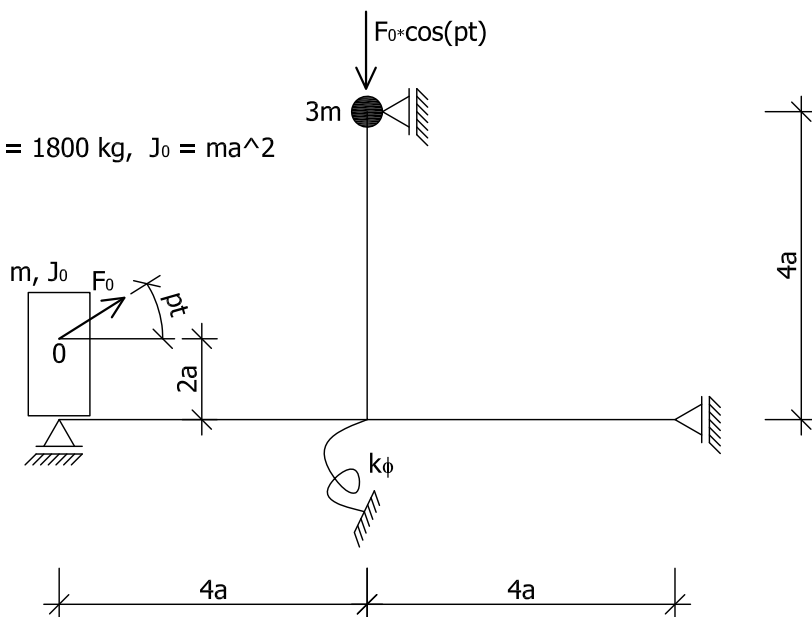
$$k_\Delta = 5EJ/3a^3, k_\phi = 4EJ/3a$$



28

$$a = 1,0 \text{ m}, F_0 = 3 \text{ kN}, m = 1800 \text{ kg}, J_0 = ma^2$$

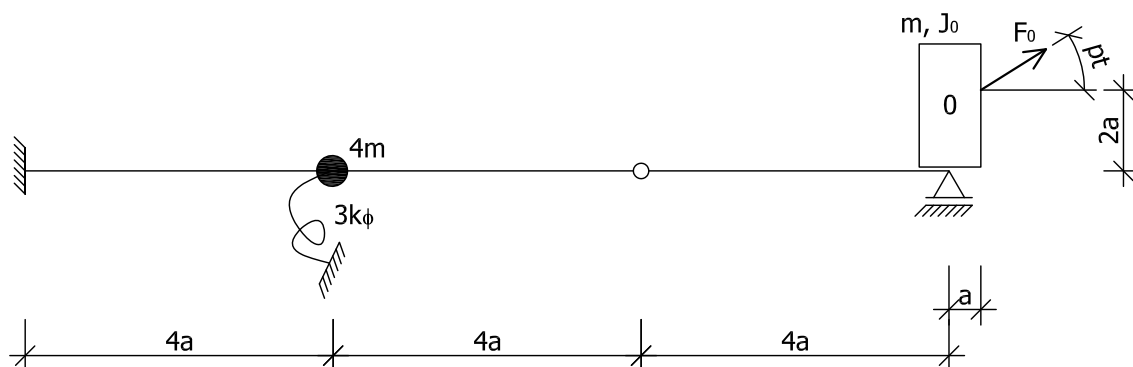
$$k_\phi = 2EJ/3a$$



29

$$a = 1,2 \text{ m}, F_0 = 2,5 \text{ kN}, m = 2200 \text{ kg}, J_0 = 0,5ma^2$$

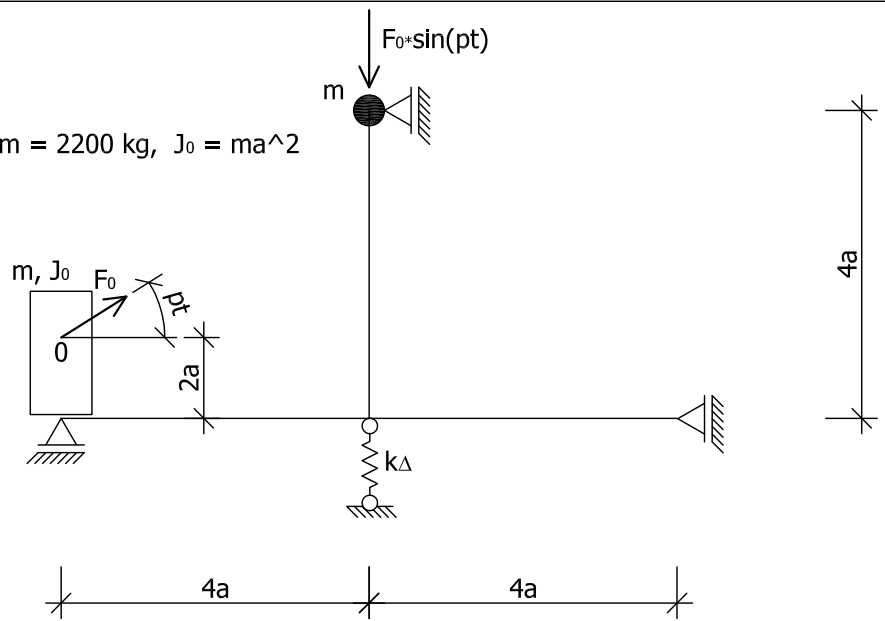
$$k_\Delta = 5EJ/3a^3, k_\phi = 4EJ/3a$$



30

$$a = 1,2 \text{ m}, F_0 = 2,5 \text{ kN}, m = 2200 \text{ kg}, J_0 = ma^2$$

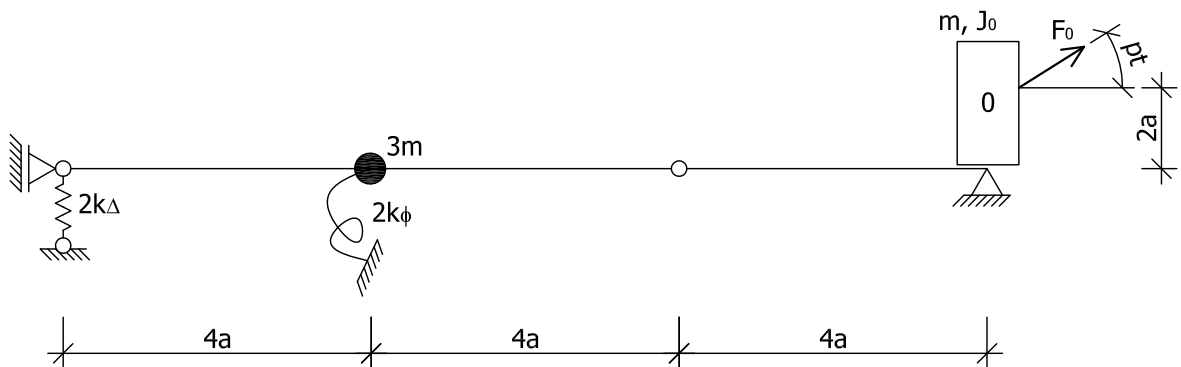
$$k_{\Delta} = 4EJ/3a^3$$



31

$$a = 1,1 \text{ m}, F_0 = 1,5 \text{ kN}, m = 1300 \text{ kg}, J_0 = 0,5ma^2$$

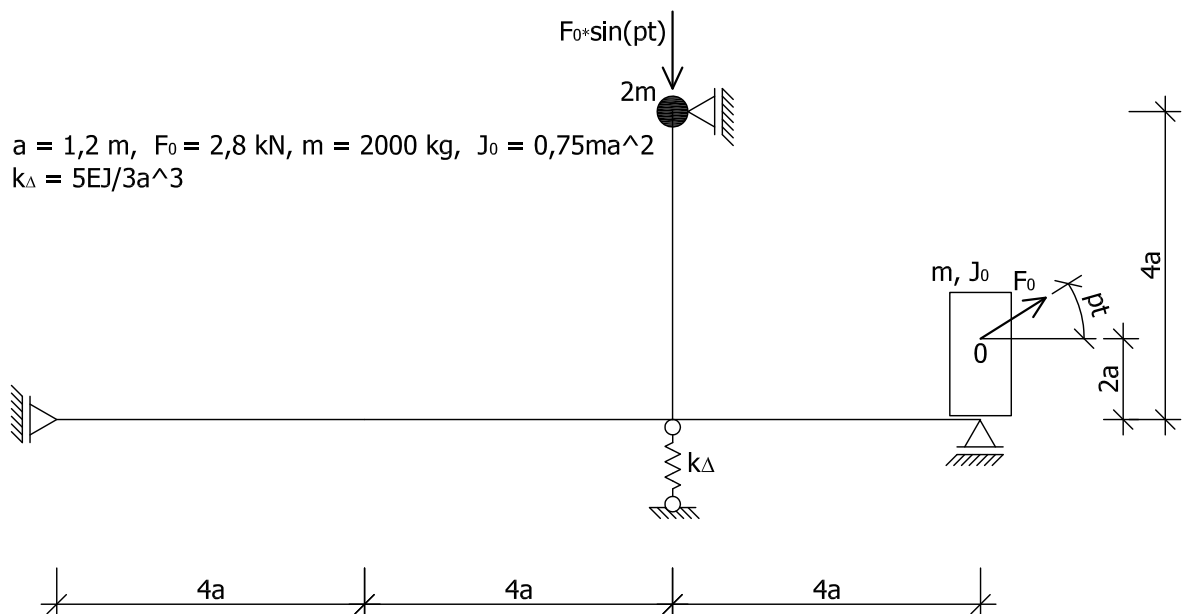
$$k_{\Delta} = 4EJ/3a^3, k_{\phi} = 2EJ/3a$$



32

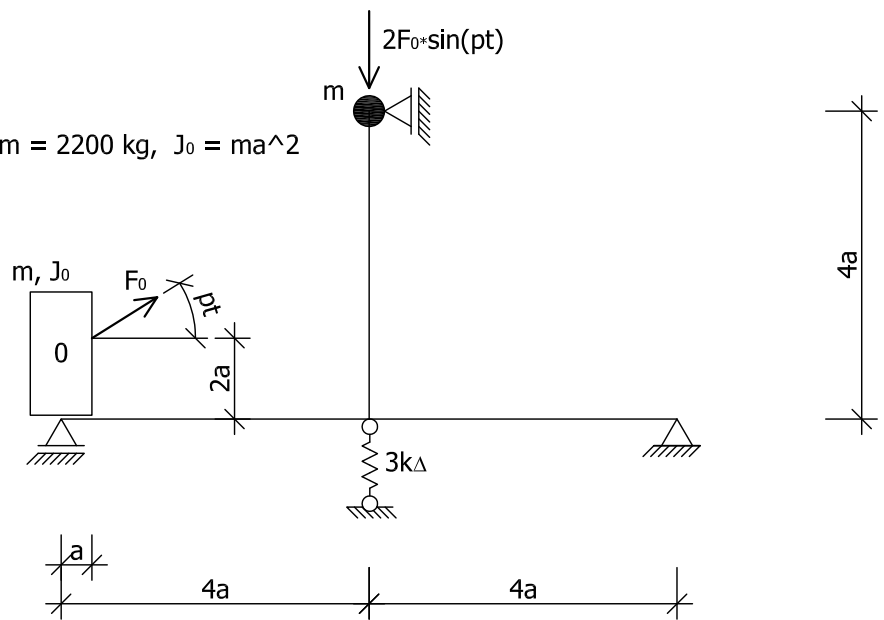
$$a = 1,2 \text{ m}, F_0 = 2,8 \text{ kN}, m = 2000 \text{ kg}, J_0 = 0,75ma^2$$

$$k_{\Delta} = 5EJ/3a^3$$



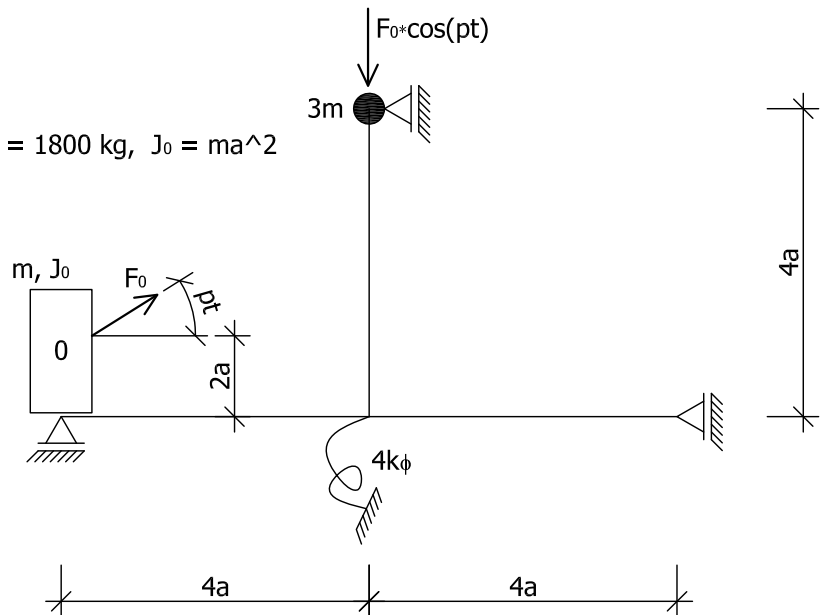
33

$a = 1,2 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 2200 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 4EJ/3a^3$



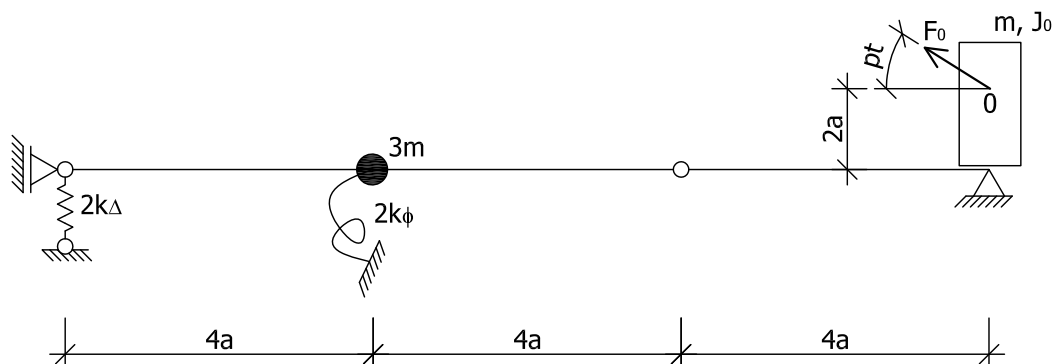
34

$a = 1,0 \text{ m}$, $F_0 = 3 \text{ kN}$, $m = 1800 \text{ kg}$, $J_0 = ma^2$
 $k_\phi = 2EJ/3a$



35

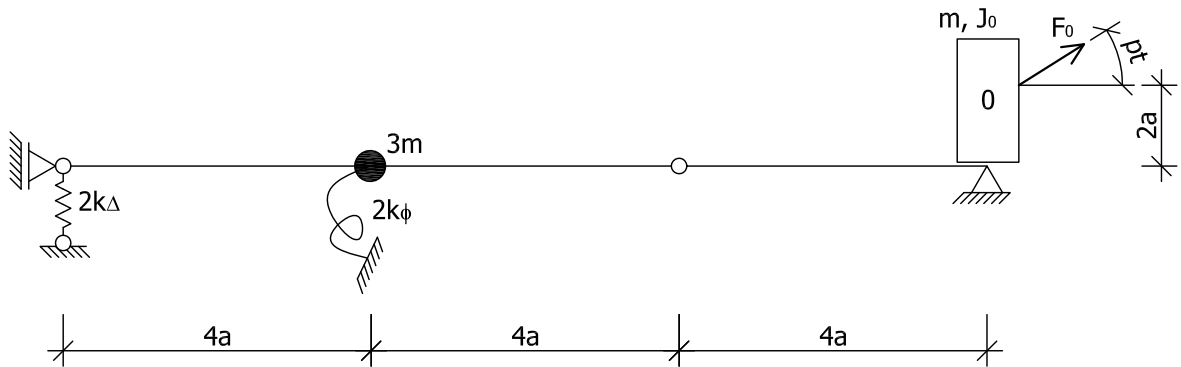
$a = 1,1 \text{ m}$, $F_0 = 4,5 \text{ kN}$, $m = 1700 \text{ kg}$, $J_0 = 0,75ma^2$
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 2EJ/3a$



36

$$a = 1,1 \text{ m}, F_0 = 1,5 \text{ kN}, m = 1300 \text{ kg}, J_0 = 0,5ma^2$$

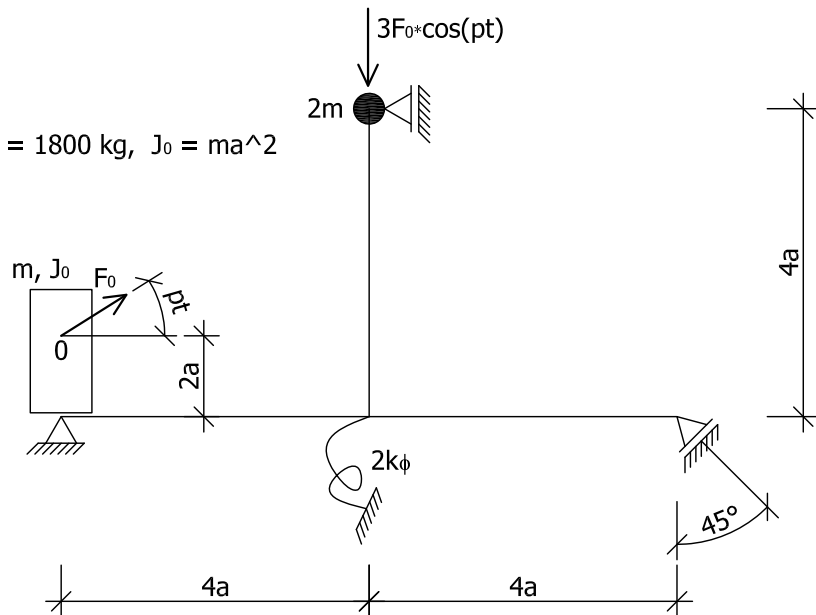
$$k_\Delta = 4EJ/3a^3, k_\phi = 2EJ/3a$$



37

$$a = 1,0 \text{ m}, F_0 = 3 \text{ kN}, m = 1800 \text{ kg}, J_0 = ma^2$$

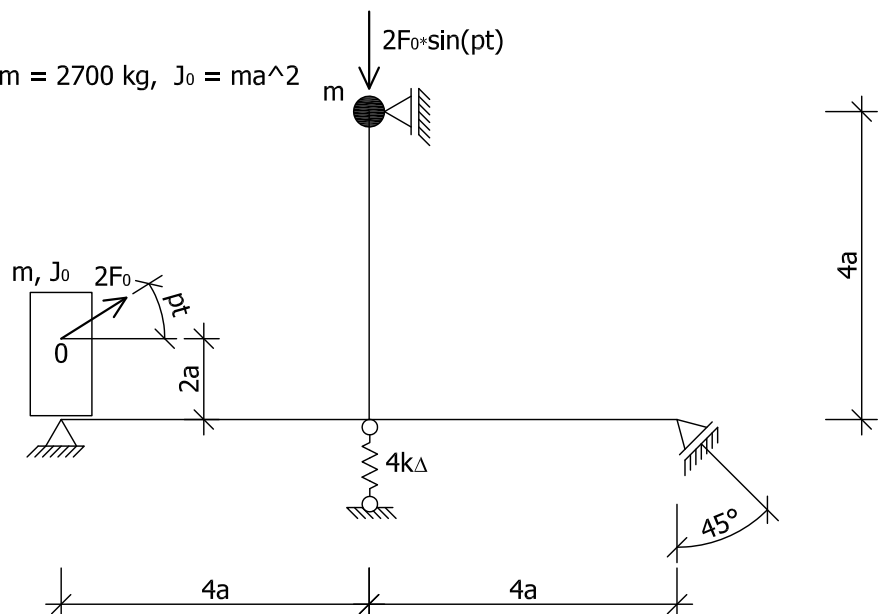
$$k_\phi = 2EJ/3a, p = 0,95\omega_1$$



38

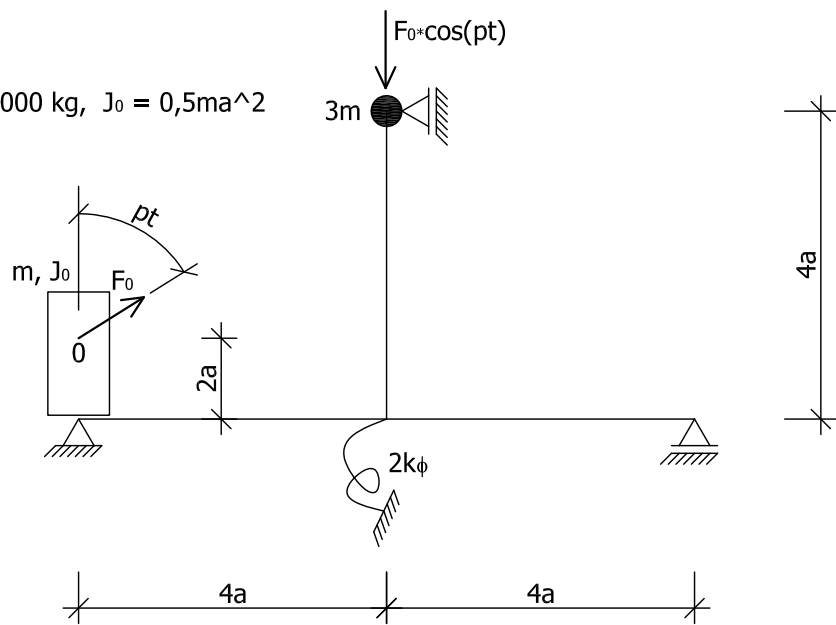
$$a = 1,0 \text{ m}, F_0 = 2,4 \text{ kN}, m = 2700 \text{ kg}, J_0 = ma^2$$

$$k_\Delta = 2EJ/3a^3$$



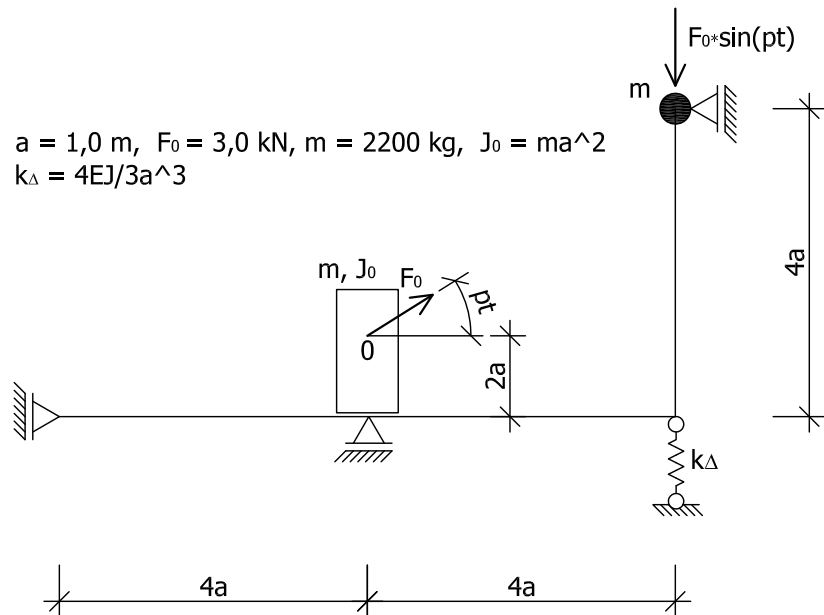
39

$a = 1,0 \text{ m}$, $F_0 = 3 \text{ kN}$, $m = 2000 \text{ kg}$, $J_0 = 0,5ma^2$
 $k_\phi = 2EJ/3a$



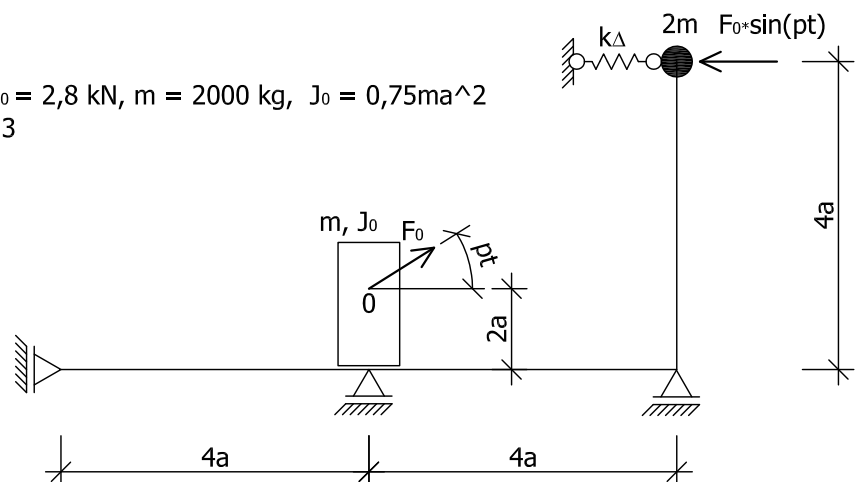
40

$a = 1,0 \text{ m}$, $F_0 = 3,0 \text{ kN}$, $m = 2200 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 4EJ/3a^3$



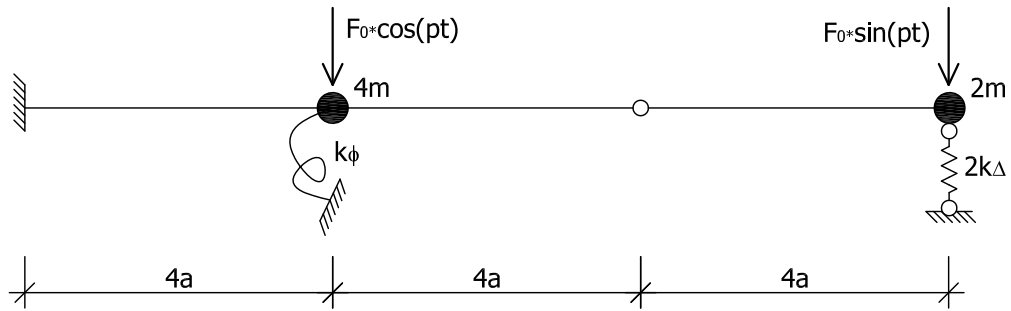
41

$a = 1,2 \text{ m}$, $F_0 = 2,8 \text{ kN}$, $m = 2000 \text{ kg}$, $J_0 = 0,75ma^2$
 $k_\Delta = 5EJ/3a^3$



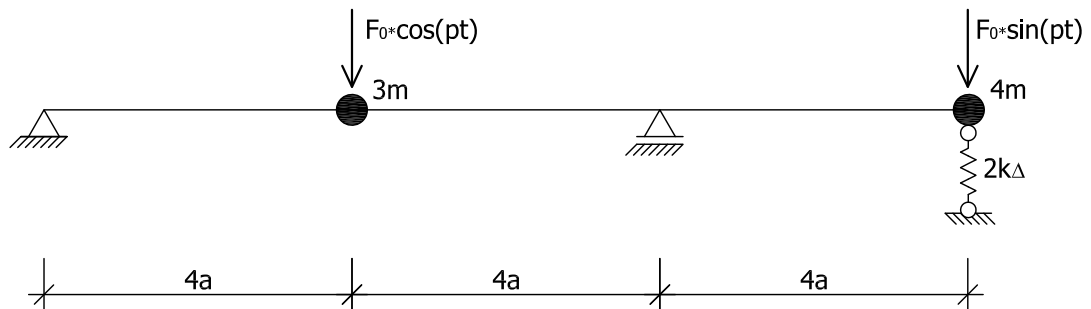
42

$a = 1,0 \text{ m}$, $F_0 = 3 \text{ kN}$, $m = 1500 \text{ kg}$,
 $k_{\Delta} = 4EJ/3a^3$, $k_{\phi} = 2EJ/3a$



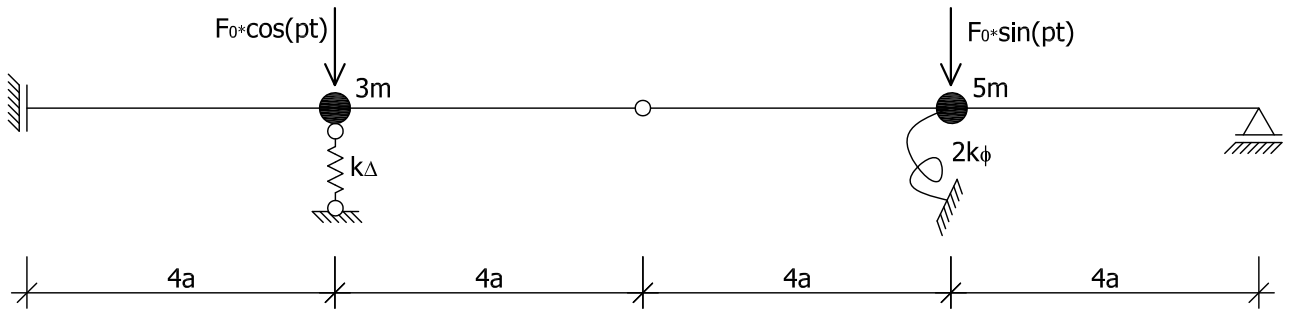
43

$a = 1,0 \text{ m}$, $F_0 = 3 \text{ kN}$, $m = 1500 \text{ kg}$,
 $k_{\Delta} = EJ/3a^3$



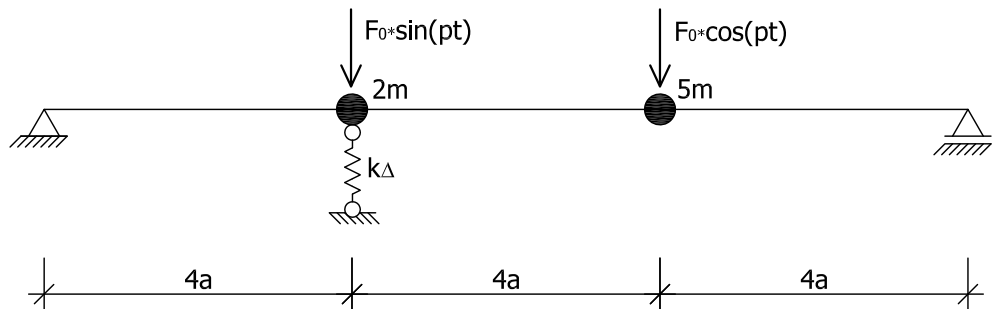
44

$a = 1,2 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 2200 \text{ kg}$,
 $k_{\Delta} = 5EJ/3a^3$, $k_{\phi} = 4EJ/3a$



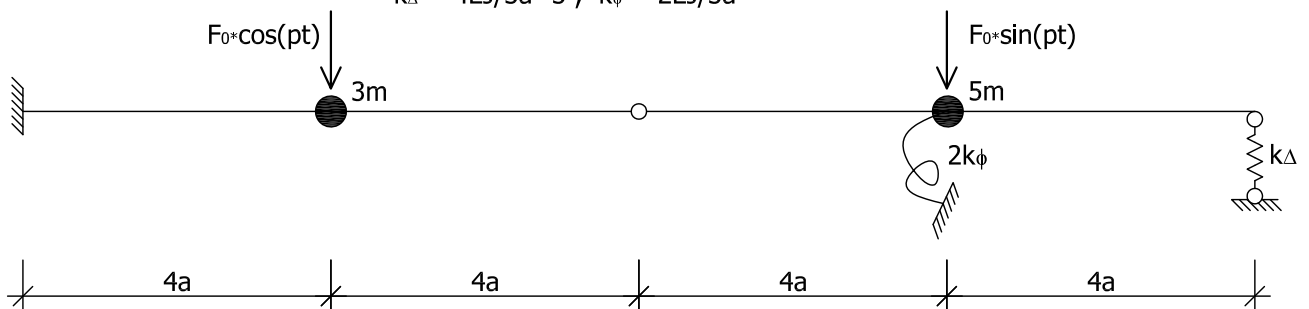
45

$a = 1,0 \text{ m}$, $F_0 = 3,5 \text{ kN}$, $m = 2000 \text{ kg}$,
 $k_{\Delta} = 4EJ/3a^3$



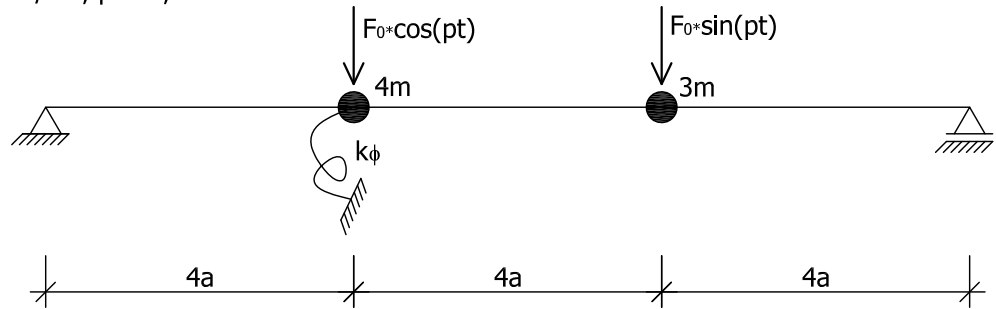
46

$a = 1,0 \text{ m}$, $F_0 = 1,5 \text{ kN}$, $m = 1300 \text{ kg}$,
 $k_{\Delta} = 4EJ/3a^3$, $k_{\phi} = 2EJ/3a$



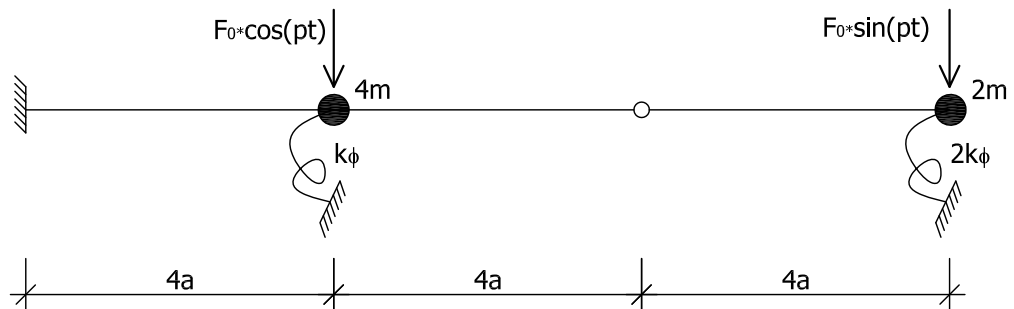
47

$a = 1,0 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 2000 \text{ kg}$,
 $k_\phi = 4EJ/3a$, $p = 0,95\omega_2$



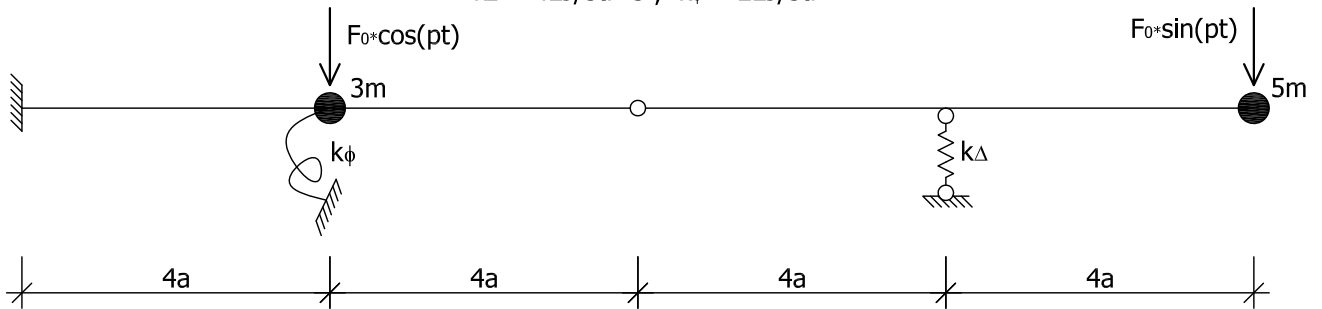
48

$a = 1,0 \text{ m}$, $F_0 = 3 \text{ kN}$, $m = 1500 \text{ kg}$,
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 2EJ/3a$



49

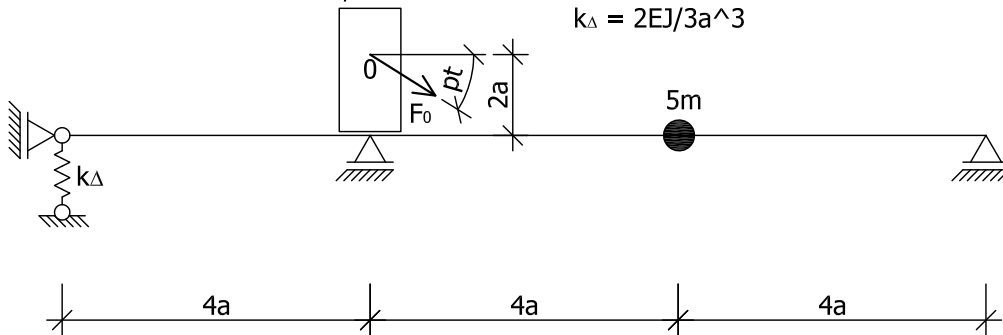
$a = 0,8 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 2200 \text{ kg}$,
 $k_\Delta = 4EJ/3a^3$, $k_\phi = 2EJ/3a$



50

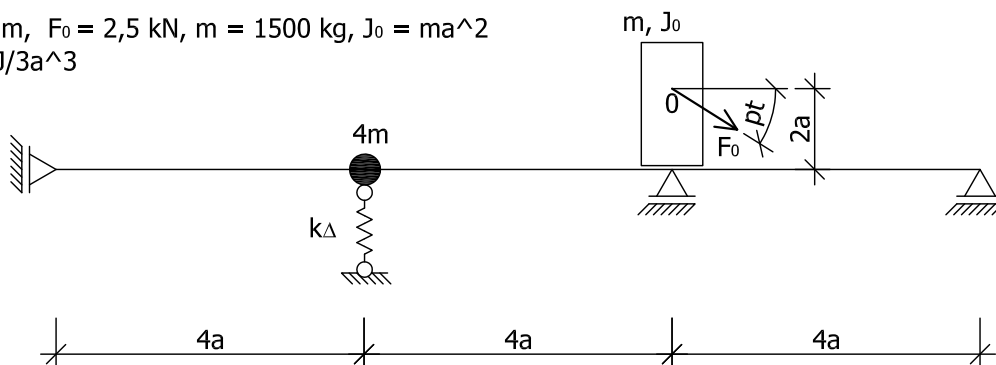
m, J_0

$a = 1,2 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = 0,5ma^2$,
 $k_\Delta = 2EJ/3a^3$



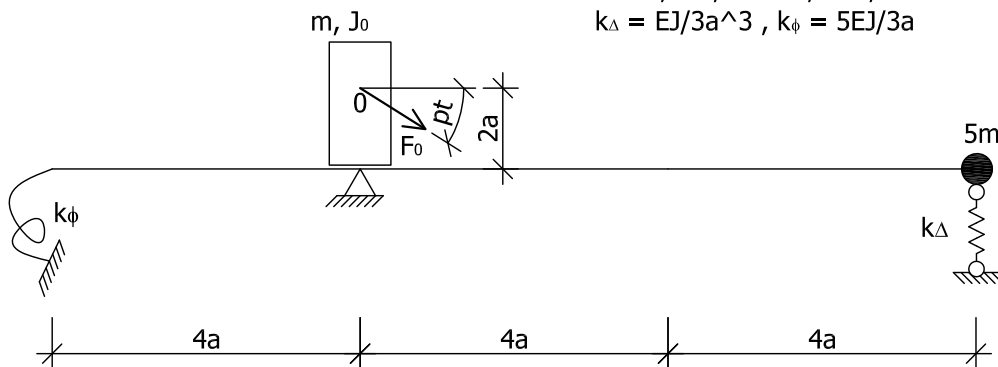
51

$a = 1,2 \text{ m}$, $F_0 = 2,5 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = ma^2$,
 $k_\Delta = 4EJ/3a^3$



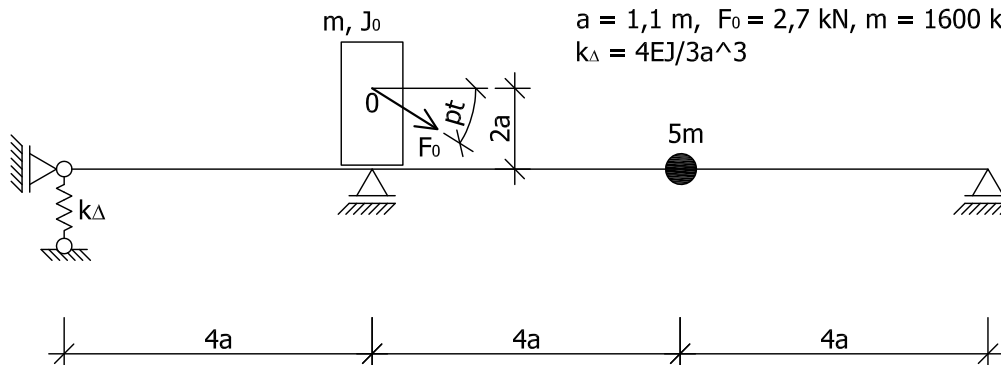
52

$a = 1,0 \text{ m}$, $F_0 = 3,2 \text{ kN}$, $m = 1500 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = EJ/3a^3$, $k_\phi = 5EJ/3a$



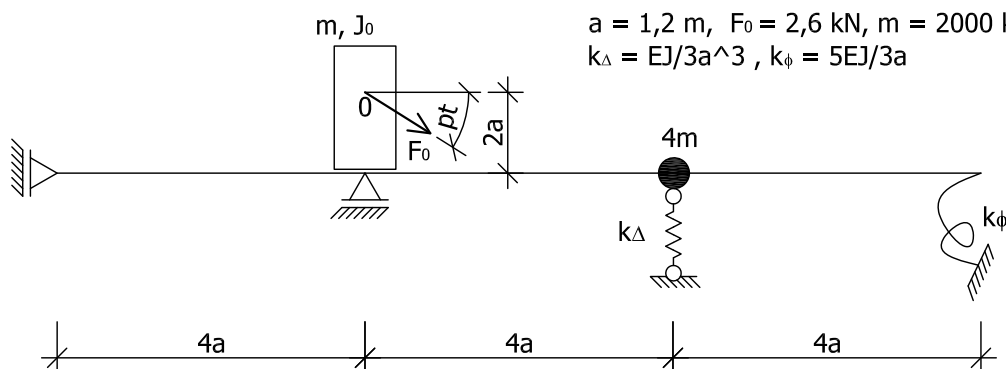
53

$a = 1,1 \text{ m}$, $F_0 = 2,7 \text{ kN}$, $m = 1600 \text{ kg}$, $J_0 = 0,5ma^2$
 $k_\Delta = 4EJ/3a^3$



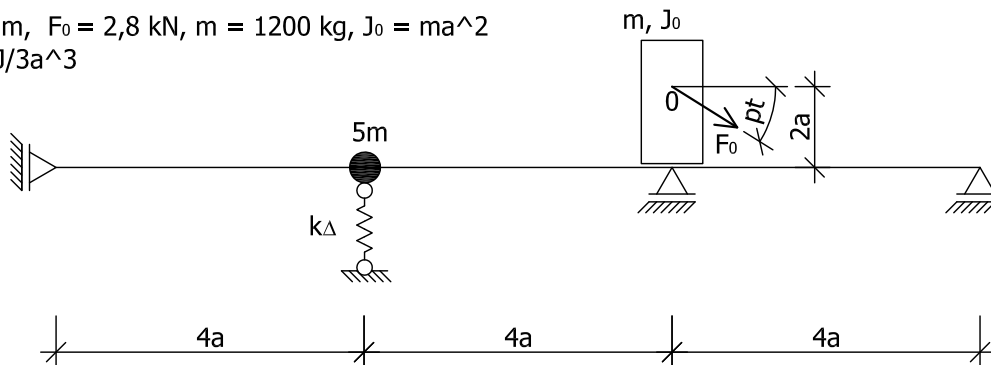
54

$a = 1,2 \text{ m}$, $F_0 = 2,6 \text{ kN}$, $m = 2000 \text{ kg}$, $J_0 = 0,5ma^2$
 $k_\Delta = EJ/3a^3$, $k_\phi = 5EJ/3a$



55

$a = 1,1 \text{ m}$, $F_0 = 2,8 \text{ kN}$, $m = 1200 \text{ kg}$, $J_0 = ma^2$
 $k_\Delta = 8EJ/3a^3$



56

$a = 1,0 \text{ m}$, $F_0 = 3,2 \text{ kN}$, $m = 1800 \text{ kg}$, $J_0 = 0,75ma^2$
 $k_\Delta = 5EJ/3a^3$

