**The laboratory work 4**

An uneven plot with a complex profile is given. Two identical systems are moving along it, each of which is a cargo of mass m attached to a continuously moving vehicle with a constant horizontal velocity V1 (for the first system) and V2 (for the second system) to the wheel (Figure).

It is known that at a speed V1, the system moves during the time interval Time1 along the section described by equation (1), and then with the periodicity Time2 for the speed V1 and (Time2' for the speed V2).
The section profile is described by equations (2) and (3) alternately:

*y = h (1 – e-γx)* (1)

*y = A1cos x* (2)

*y = A2sin x* (3)

where h is the limit to which the height of the unevenness tends, γ is the parameter characterizing the curvature of the profile, and A1 and A2 are the oscillation amplitudes.

The first system at the initial moment of time is located at the beginning of the path, and the second is located at the beginning of the cosine-shaped section. At the initial time, the first system starts moving at a speed V = V1, and the second remains in place. As soon as the first system reaches the end of the exponential section, the second system starts moving at a speed V = V2 (where V2> V1), and then both systems move together.

Since x = Vt (where V = V1), the differential equations describing the vertical oscillations ξ (initially absent) of the first cargo are written as follows:
for equation (1):

 (4)

For equation 2

 (5)

For equation 3

 (6)

where c is the rigidity of the elastic suspension.
Let c = 0.5 kg / s2.
The movements of the second load are described by equations (5) and (6) under the condition that V = V2.
If the limit h is less than hmin = 0.001 m or the amplitudes A1 and A2 are less than Amin = 0.01 m, the section profile is considered straightforward and the load oscillations are described by the equation:

  (7)

Build a model of this system

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| variant | *m*  | *V1* | *V2*  |  *Time1* | *Time2* | *Time2’* | *h* | *γ* | *А1* | *А2* |
| 1 | 0.7 *кг*  | 0.9 *м/с* | 1 *м/с* | 20 *с* | 30 *с* | 27 *с* | *1 м* | 1 | 0.8 *м* | 0.7 *м* |
| 2 | 1.7 *кг*  | 1.8 *м/с* | 2 *м/с* | 10 *с* | 40 *с* | 33 *с* | *1.5 м* | 2 | 1.8 *м* | 1.2 *м* |
| 3 | 2.5 *кг*  | 0.5 *м/с* | 3 *м/с* | 15 *с* | 20 *с* | 45 *с* | *2,1 м* | 4 | 1.8 *м* | 1.3*м* |
| 4 | 1.6 *кг*  | 1.3*м/с* | 5*м/с* | 30 *с* | 10 *с* | 15 *с* | *0.5 м* | 3 | 1.5 *м* | 2.7 *м* |
| 5 | 3.3 *кг*  | 1.9 *м/с* | 1 *м/с* | 25 *с* | 30 *с* | 18 *с* | *2,2 м* | 3 | 0.8 *м* | 0.6 *м* |
| 6 | 5.7 *кг*  | 1.1 *м/с* | 3 *м/с* | 35 *с* | 10 *с* | 23 *с* | *3,5 м* | 5 | 1,2 *м* | 1,5 *м* |
| 7 | 10.5 *кг*  | 2.5 *м/с* | 6 *м/с* | 40 *с* | 15 *с* | 35 *с* | *5,6 м* | 9 | 2,6 *м* | 2,3 *м* |
| 8 | 12.8 *кг*  | 3.4 *м/с* | 8 *м/с* | 50 *с* | 25 *с* | 52 *с* | *1,4 м* | 6 | 3,4 *м* | 3,1 *м* |