From what we know about transient phenomena, we have to find the most general solution to the homogeneous eqn

$$\ddot{x}_1 + \omega_0^2 x_1 = 0.$$, which takes the form

$$x_{1h} = C_1 \sin \omega_0 t + C_2 \cos \omega_0 t.$$

We then have to find a particular solution to the inhomogeneous eqn:

$$\boxed{m\ddot{x}_1 + Kx_1 = Kut.} \quad (*)$$

Here we can make the ansatz:

$$x_{1I} = At + B.$$

Substituting back into (*) we obtain the values of A and B.

$$K(At+B) = Kut \Rightarrow A = u \; ; \; B = 0.$$

So $x_{1I} = ut.$