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1. Линеаризовать систему и построить структурную схему линеаризованной системы.

а) $\sin \ddot{x} + \dot{x}\, x = t\, g^2 + \dot{g}$, опорная траектория $x^*(t) = 16\, t$, $g^*(t) = 16$;

б) $\dddot{x}\, x^{16} + \ddot{x} \sin \dot{x} + \operatorname{arctg}\, x^{16} = -g\, \dot{x}^2 + e^{\dot{g}}$,

опорная траектория $x^*(t) = 1$, $g^*(t) = t\, \ln \frac{\pi}{4}$.

а) $F = \sin \ddot{x} + \dot{x} x - t g^2 - \dot{g} = 0$

Пусть начальные условия будут: $x(0) = x_0$, $\dot{x}(0) = \dot{x}_0$

$a_2(t) = \left(\frac{\partial F}{\partial \ddot{x}}\right)_* = (\cos \ddot{x})_* = \cos 0 = 1$ $\qquad b_1(t) = -\left(\frac{\partial F}{\partial \dot{g}}\right)_* = 1$

$a_1(t) = \left(\frac{\partial F}{\partial \dot{x}}\right)_* = (x)_* = 16t$ $\qquad b_0(t) = \left(\frac{\partial F}{\partial g}\right)_* = (2tg)_* = 32t$

$a_0(t) = \left(\frac{\partial F}{\partial x}\right)_* = (\dot{x})_* = 16$

Диф. ур-е линеаризованной сис-мы:

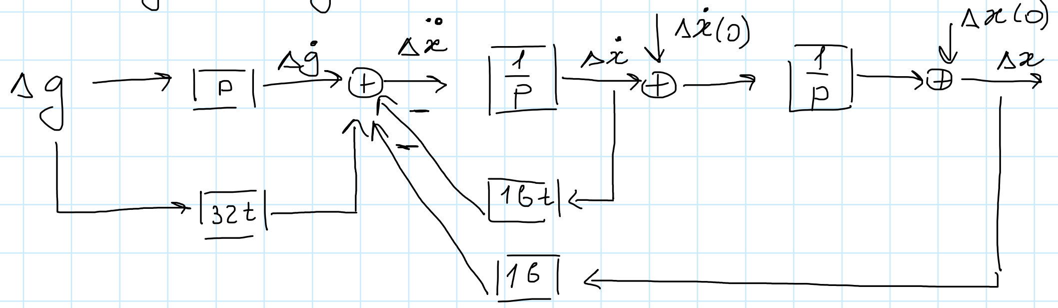
$$\Delta \ddot{x} + 16t \Delta \dot{x} + 16 \Delta x = \Delta \dot{g} + 32t \Delta g$$

$\Delta x(0) = x_0 - x^*(0) = x_0$

$\Delta \dot{x}(0) = \dot{x}_0 - \dot{x}^*(0) = \dot{x}_0 - 16$

Структурная схема:

$$\Delta \ddot{x} = \Delta \dot{g} + 32t \Delta g - 16t \Delta \dot{x} - 16 \Delta x$$



б) $F = \dddot{x}\, x^{16} + \ddot{x} \sin \dot{x} + \operatorname{arctg} x^{16} + g \dot{x}^2 - e^{\dot{g}} = 0$

Пусть начальные словия будут: $x(0) = x_0$, $\dot{x}(0) = \dot{x}_0$, $\ddot{x}(0) = \ddot{x}_0$

$a_3(t) = \left(\frac{\partial F}{\partial \dddot{x}}\right)_* = (x^{16})_* = 1$ $\qquad b_1(t) = -\left(\frac{\partial F}{\partial \dot{g}}\right)_* = (e^{\dot{g}})_* = \frac{\pi}{4}$

$a_2(t) = \left(\frac{\partial F}{\partial \ddot{x}}\right)_* = (\sin \dot{x})_* = 0$ $\qquad b_0(t) = -\left(\frac{\partial F}{\partial g}\right)_* = (\dot{x}^2)_* = 0$

$a_1(t) = \left(\frac{\partial F}{\partial \dot{x}}\right)_* = (\ddot{x} \cos \dot{x} + 2 g \dot{x})_* = 0$

$$a_0(t) = \left(\frac{\partial F}{\partial x}\right)_* = \left(16\dddot{x}\,x^{15} + \frac{1}{1+x^{32}}\cdot 16\cdot x^{15}\right)_* = \frac{16}{2} = 8$$

$$\Delta\dddot{x} + 8\Delta x = \frac{\pi}{4}\Delta\dot{g}$$

$$\Delta x(0) = x_0 - x^*(0) = x_0 - 1$$

$$\Delta\dot{x}(0) = \dot{x}_0 - \dot{x}^*(0) = \dot{x}_0$$

$$\Delta\ddot{x}(0) = \ddot{x}_0 - \ddot{x}^*(0) = \ddot{x}_0$$

Структурная схема:

$$\Delta\dddot{x} = \frac{\pi}{4}\Delta\dot{g} - 8\Delta x$$