

1.) Selvitä menetelmiä, joiden avulla fysikaalisen mallinnuksen tuloksena saatavaa mahdollista monimutkaista mallia voidaan yksinkertaistaa? (6p)

2.) Muodosta tilaesitys seuraavalle differentiaaliyhtälölle: (6p)

$$\ddot{y}^2 - y^2 y^4 - 1 = 0$$

3.) Virtausprosessia kuvaava dynaaminen malli on:

$$\frac{d}{dt}h(t) = -\frac{a\sqrt{2g}}{A}\sqrt{h(t)} + \frac{1}{A}u(t)$$
$$q(t) = a\sqrt{2g}\sqrt{h(t)}$$

Mikä on tilan arvo stationääripisteessä, kun sisäänvirtaus on u_0 (6p)

4.) a) Taajuusanalyysin periaate? (3p)

b) Taajuusanalyysin hyödyt ja haitat? (3p)

5.) Piirrä Simulink-simulaattori seuraavan differentiaaliyhtälön kuvaamalle järjestelmälle: (6p)

$$\dot{x}_1 = x_1^2 \sin(u) + 8x_2$$
$$\dot{x}_2 = x_1 x_2 + \cos(u) + 1$$
$$y = -x_1^2 + x_2$$
$$u = -y$$

Huom !

Liitteenä Simulink-lohkot.

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- Abs
- Algebraic Constraint
- Assignment
- Bitwise Logical Operator
- Combinatorial Logic
- Complex to Magnitude-Angle
- Complex to Real-Imag
- Dot Product
- Gain
- Logical Operator
- Magnitude-Angle to Complex
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- Backlash
- Coulomb & Viscous Friction
- Dead Zone
- Hit Crossing
- Quantizer
- Rate Limiter
- Relay
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- Band-Limited White Noise
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- Digital Clock
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- From File
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