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18 | ENG 06 | 033

MECHANICAL ENG

ENG 282

Assignment.

- (a) Define a dynamic equation.
- (b) An engineering system is described by the expression given in Equation (1). Develop a dynamic model in form of an ordinary differential equation for the system.

$$y = Ate^t$$

Solution.

- (a) Dynamic Equation refers to:
- \* Difference equation in discrete time
  - \* differential equation in continuous time.
  - \* time scale calculus in combined discrete and continuous time.

(b)  $y = Ate^t$  — (1) (where A is constant)

$$\frac{dy}{dt} = At \frac{d}{dt}(e^t) + e^t \frac{d}{dt}(At)$$

$$\frac{dy}{dt} = Ate^t + Ae^t \quad \text{--- (2)}$$

From equation (1), make  $Ae^t$  the subject of formula

$$y = Ate^t$$

$$\frac{y}{t} = Ae^t \quad \text{--- (3)}$$

Put equation (1) and (3) in equation (2)

$$= \frac{dy}{dt} = y + \frac{y}{t}$$

Multiply through by  $t$ .

$$t \frac{dy}{dt} = ty + y$$

$$t \frac{dy}{dt} = (t+1)y$$

$$\therefore t \frac{dy}{dx} - (1+t)y = 0 //$$