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).

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

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

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

$$y = Ate^t$$

$$\frac{y}{t} = Ae^t \text{ — (3)}$$

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

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

Multiply through by t.

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

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

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