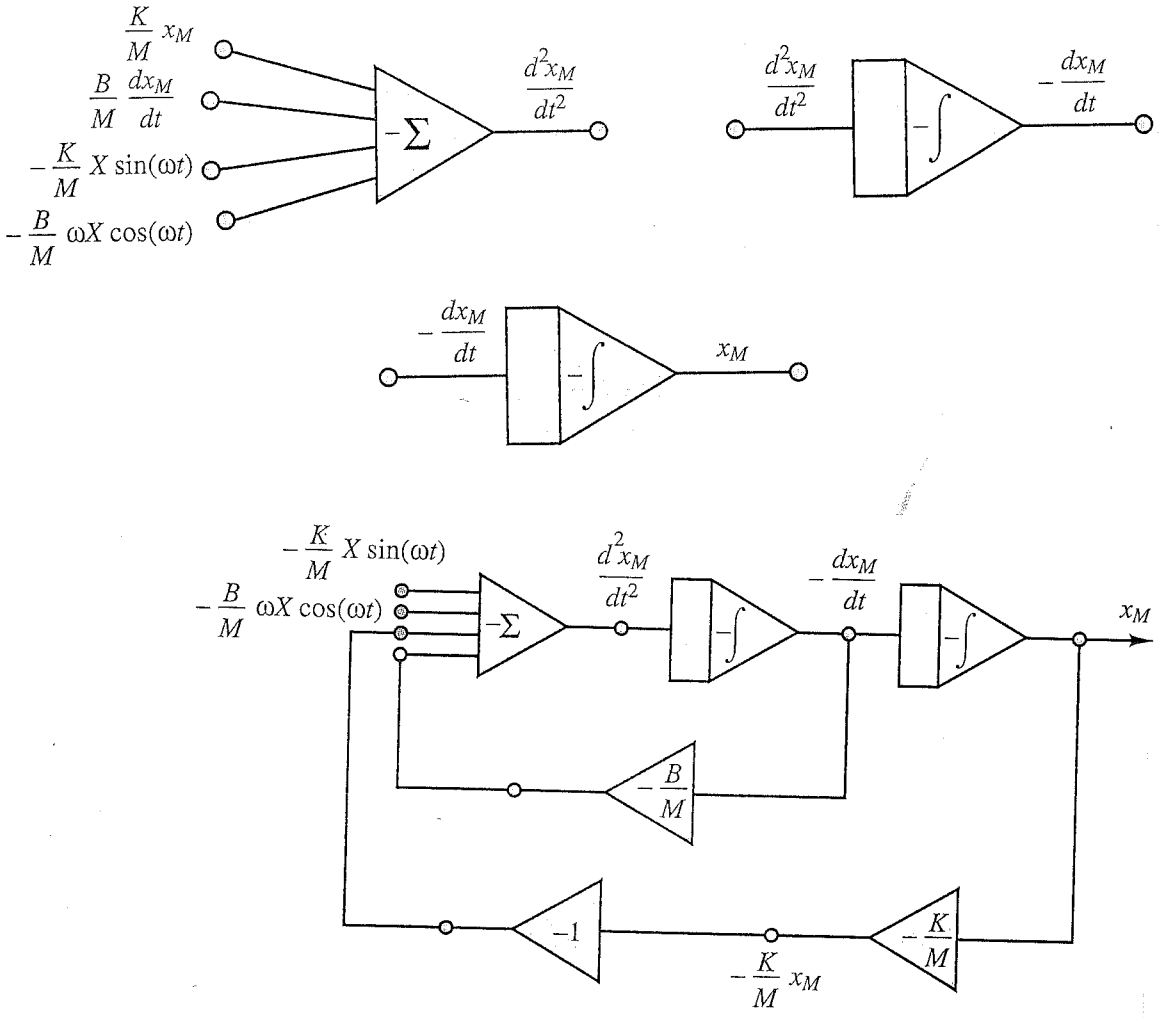

$$x = -\frac{R_5}{R_4}z = -400z$$

Next, we move to the left to determine the relationship between y and z:

$$z = -\frac{1}{R_3C_2}\int y(t')\,dt' \qquad \text{or} \qquad y = -\frac{dz}{dt}$$

Finally, we determine y as a function of x and f:

$$y = -\frac{1}{R_2C_1}\int x(t')\,dt' - \frac{1}{R_1C_1}\int f(t')\,dt' = -\int \left[x(t') + 2.5f(t')\right]dt'$$

or

$$\frac{dy}{dt} = -x - 2.5f$$

Substituting the expressions into one another and eliminating the variables y and z, we obtain the differential equation in x:

$$x = -400z$$

$$\frac{dx}{dt} = -400\frac{dz}{dt} = 400y$$

$$\frac{d^2x}{dt^2} = 400\frac{dy}{dt} = 400\,(x - 2.5f)$$

and

$$\frac{d^2x}{dt^2} + 400x = -1{,}000f$$