```
"ANALITIK COZUM"
q0 = {0, 0, 0};
dq0 = {1, 0, 0};
q = Sum[
  (Um[[All, i]].M.q0 * Cos[ωi[[i]] * t] + 1 / ωi[[i]] * Um[[All, i]].M.dq0 * Sin[ωi[[i]] * t]) *
   Um[[All, i]]  , {i, 1, 3 }]
```

ANALITIK COZUM

```
{-0.193239 (0. Cos[0.693019 t] - 0.278837 Sin[0.693019 t]) +
  0.932324 (0. Cos[0.982431 t] + 0.948997 Sin[0.982431 t]) -
  0.305665 (0. Cos[2.07715 t] - 0.147156 Sin[2.07715 t]),
 -4.89838 (0. Cos[0.693019 t] - 0.278837 Sin[0.693019 t]) -
  1.00213 (0. Cos[0.982431 t] + 0.948997 Sin[0.982431 t]) +
  0.0400656 (0. Cos[2.07715 t] - 0.147156 Sin[2.07715 t]),
 -0.219607 (0. Cos[0.693019 t] - 0.278837 Sin[0.693019 t]) +
  1.22883 (0. Cos[0.982431 t] + 0.948997 Sin[0.982431 t]) +
  3.88695 (0. Cos[2.07715 t] - 0.147156 Sin[2.07715 t])}
```

```
"SolutionBySolver"
TIME = 10;

X = {x1[t], x2[t], x3[t]};
D2X = D[X, {t, 2}];
Eqs = {0, 0, 0};

Table[Eqs[[i]] = (M.D2X + K.X)[[i]] == 0, {i, 1, 3}];
Eqs // MatrixForm
vars = {x1, x2, x3}
IC = {x1[0] == 0, x2[0] == 0, x3[0] == 0, x1'[0] == 1, x2'[0] == 0, x3'[0] == 0}
dsol = NDSolve[Flatten[{Eqs, IC}], vars, {t, 0, TIME}, AccuracyGoal → 16,
   PrecisionGoal → 16, Method → "ExplicitRungeKutta", MaxSteps → ∞]
Plot[Evaluate[x1[t] /. %], {t, 0, TIME}]
Plot[q[[1]], {t, 0, TIME}]
Plot[q[[1]] - Evaluate[x1[t] /. dsol], {t, 0, TIME}, PlotRange → All]
```

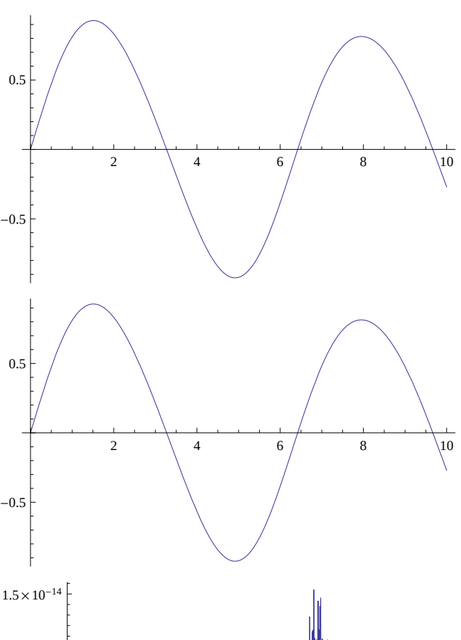
SolutionBySolver

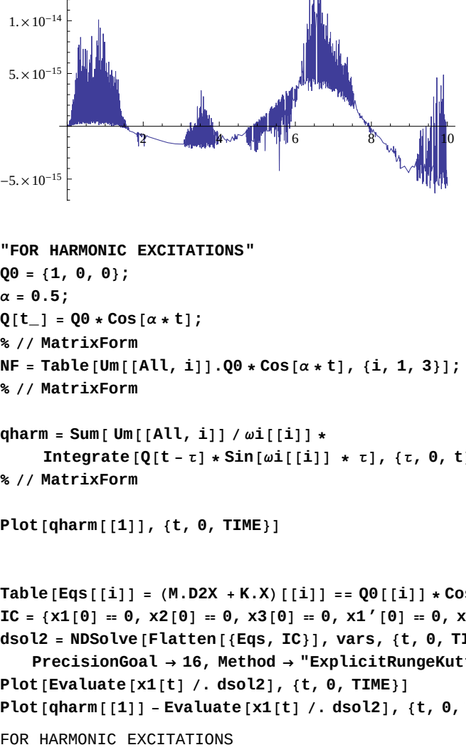
$$\begin{pmatrix} 1.26\,x1[t] - 0.02\,x2[t] - 0.24\,x3[t] + x1''[t] == 0 \\ -0.02\,x1[t] + 0.02\,x2[t] + 0.04\,x2''[t] == 0 \\ -0.24\,x1[t] + 0.24\,x3[t] + 0.06\,x3''[t] == 0 \end{pmatrix}$$

```
{x1, x2, x3}

{x1[0] == 0, x2[0] == 0, x3[0] == 0, x1'[0] == 1, x2'[0] == 0, x3'[0] == 0}

{{x1 → InterpolatingFunction[{{0., 10.}}, <>], x2 → InterpolatingFunction[{{0., 10.}}, <>],
  x3 → InterpolatingFunction[{{0., 10.}}, <>]}}
```






```
"FOR HARMONIC EXCITATIONS"
Q0 = {1, 0, 0};
α = 0.5;
Q[t_] = Q0 * Cos[α * t];
% // MatrixForm
NF = Table[Um[[All, i]].Q0 * Cos[α * t], {i, 1, 3}];
% // MatrixForm

qharm = Sum[ Um[[All, i]] / ωi[[i]] *
     Integrate[Q[t - τ] * Sin[ωi[[i]] * τ], {τ, 0, t}].Um[[All, i]] , {i, 1, 3}];
% // MatrixForm

Plot[qharm[[1]], {t, 0, TIME}]


Table[Eqs[[i]] = (M.D2X + K.X)[[i]] == Q0[[i]] * Cos[α * t], {i, 1, 3}];
IC = {x1[0] == 0, x2[0] == 0, x3[0] == 0, x1'[0] == 0, x2'[0] == 0, x3'[0] == 0};
dsol2 = NDSolve[Flatten[{Eqs, IC}], vars, {t, 0, TIME}, AccuracyGoal → 16,
    PrecisionGoal → 16, Method → "ExplicitRungeKutta", MaxSteps → ∞];
Plot[Evaluate[x1[t] /. dsol2], {t, 0, TIME}]
Plot[qharm[[1]] - Evaluate[x1[t] /. dsol2], {t, 0, TIME}, PlotRange → All]
```

FOR HARMONIC EXCITATIONS

$$\begin{pmatrix} \cos[0.5\,t] \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} -0.193239\cos[0.5\,t] \\ 0.932324\cos[0.5\,t] \\ -0.305665\cos[0.5\,t] \end{pmatrix}$$

$$\begin{pmatrix} 0.0538821\,(3.00952\cos[0.5\,t] - 3.00952\cos[0.693019\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[0.693019\,t]) + 0.884772\,(1.3737\cos[0.5\,t] - 1.3737\cos[0.982431\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[0.982431\,t]) + 0.0449804\,(0.51104\cos[0.5\,t] - 0.51104\cos[2.07715\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[2.07715\,t]) \\ 1.36585\,(3.00952\cos[0.5\,t] - 3.00952\cos[0.693019\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[0.693019\,t]) - 0.95102\,(1.3737\cos[0.5\,t] - 1.3737\cos[0.982431\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[0.982431\,t]) - 0.00589589\,(0.51104\cos[0.5\,t] - 0.51104\cos[2.07715\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[2.07715\,t]) \\ 0.0612345\,(3.00952\cos[0.5\,t] - 3.00952\cos[0.693019\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[0.693019\,t]) + 1.16616\,(1.3737\cos[0.5\,t] - 1.3737\cos[0.982431\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[0.982431\,t]) - 0.571988\,(0.51104\cos[0.5\,t] - 0.51104\cos[2.07715\,t] + 0.\,i\sin[0.5\,t] + 0.\,i\sin[2.07715\,t]) \end{pmatrix}$$