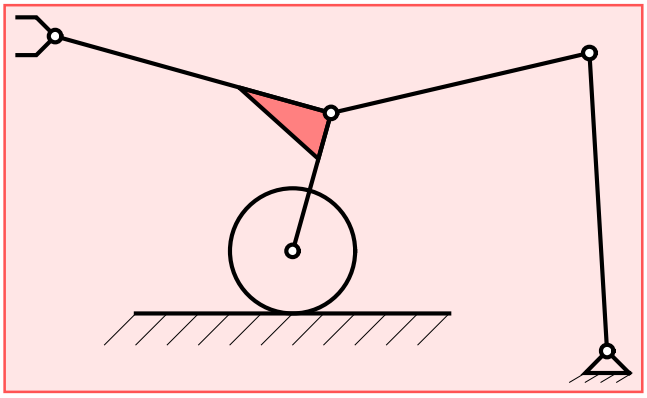
Out[38]= Вариант 31

Out[39]=



In[1]:=
```
"_____________________________________________________________________________";
"исходные данные";
dano = {r1 → 0.953, r2 → 0.847,  r3 → 0.457, Vd → 0.304,
    al → 4.35, xd0 → -2.16, yd0 → 1.18, tau → 1.37, delta → 0.01};
dano0 = { fi1 → 1.63,  fi2 → 3.37,  fi3 → 2.87};
"координаты звеньев";
R1 = {{0, 0}, {r1 Cos[fi1], r1 Sin[fi1]}};
R2 = {R1[[2]], {R1[[2, 1]] + r2 Cos[fi2], R1[[2, 2]] + r2 Sin[fi2]} };
R3M = {R2[[2]], {R2[[2, 1]] + 2 r3 Cos[fi3], R2[[2, 2]] + 2 r3 Sin[fi3]} };
R3C = {R2[[2]], {R2[[2, 1]] + r3 Cos[fi3 + Pi / 2], R2[[2, 2]] + r3 Sin[fi3 + Pi / 2]} };
"_____________________________________________________________________________";
"кинематика манипулятора";
"функция для графов";
GR[l_, om_, fi_] := {-l om Sin[fi], l om Cos[fi]};
"граф O--A--B--C"
yr1 = {0, 0} + GR[r1, om1, fi1] + GR[r2, om2, fi2] + GR[r3, om3, fi3 + Pi / 2] - {Vc, 0};
(yr1 // MatrixForm) == ({0, 0} // MatrixForm)
"граф O--A--B--M"
yr2 = {0, 0} + GR[r1, om1, fi1] + GR[r2, om2, fi2] + GR[2 r3, om3, fi3] - {Vmx, Vmy};
(yr2 // MatrixForm) == ({0, 0} // MatrixForm)
"Решение СЛАУ";
sol = Solve[
     {yr1[[1]] == 0, yr1[[2]] == 0, yr2[[1]] == 0, yr2[[2]] == 0 }, {om1, om2, om3, Vc}][[1]];
sol // MatrixForm
"Подстановка формул сближения схвата с точкой Д";
sol = sol //. {Vmx → Vdx + (xd - xm) / T, Vmy → Vdy + (yd - ym) / T};
sol = sol //. T → - tau / Log[delta];
sol = sol //. { xd → xd0 + Vdx t,  yd → yd0 + Vdy t };
sol = sol //. { xm → R3M [[2, 1]],  ym → R3M [[2, 2]]};
sol = sol //. {Vdx → Vd Cos[al], Vdy → Vd Sin[al]};
"при t=0"
sol //. dano //. dano0 //. t → 0  // MatrixForm
"Решения дифференцальных уравнений";
Ddano = {fi1 → f1[t], fi2 → f2[t], fi3 → f3[t]};
Dsol =
  NDSolve[{D[f1[t], t] == (om1 //. sol //. dano //. Ddano), f1[0] == (fi1 //. dano0),
              D[f2[t], t] == (om2 //. sol //. dano  //. Ddano ), f2[0] == (fi2 //. dano0),
             D[f3[t], t] == (om3 //. sol //. dano  //. Ddano ), f3[0] == (fi3 //. dano0) },
     {f1, f2, f3}, {t, 0, (tau //. dano)} ][[1]];
"Построение графиков";
Plot[(f1[t] /. Dsol), {t, 0, (tau //. dano) }, AxesLabel → {t, f1}]
omm1 = D[f1[t] /. Dsol, t];
Plot[omm1, {t, 0, (tau //. dano) }, AxesLabel → {t, om1}]

Plot[(f2[t] /. Dsol), {t, 0, (tau //. dano) }, AxesLabel → {t, f2} ]
omm2 = D[f1[t] /. Dsol, t];
Plot[omm2, {t, 0, (tau //. dano) }, AxesLabel → {t, om2}]

Plot[(f3[t] /. Dsol), {t, 0, (tau //. dano) }, AxesLabel → {t, f3} ]
omm3 = D[f3[t] /. Dsol, t];
Plot[omm3, {t, 0, (tau //. dano) }, AxesLabel → {t, om3}]

Plot[((Vc //. sol //. dano  //. Ddano ) /. Dsol),
 {t, 0, (tau //. dano) }, AxesLabel → {t, Vc} ]
ParametricPlot[((R3M[[2]] //. sol //. dano  //. Ddano ) /. Dsol),
 {t, 0, (tau //. dano) }, AxesLabel → {Хм, Ум} ]
```

Out[14]= граф O--A--B--C

Out[16]= $\begin{pmatrix} -Vc - om3\ r3\ Cos[fi3] - om1\ r1\ Sin[fi1] - om2\ r2\ Sin[fi2] \\ om1\ r1\ Cos[fi1] + om2\ r2\ Cos[fi2] - om3\ r3\ Sin[fi3] \end{pmatrix} == \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

Out[17]= граф O--A--B--M

Out[19]= $\begin{pmatrix} -Vmx - om1\ r1\ Sin[fi1] - om2\ r2\ Sin[fi2] - 2\ om3\ r3\ Sin[fi3] \\ -Vmy + om1\ r1\ Cos[fi1] + om2\ r2\ Cos[fi2] + 2\ om3\ r3\ Cos[fi3] \end{pmatrix} == \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

Out[22]//MatrixForm=

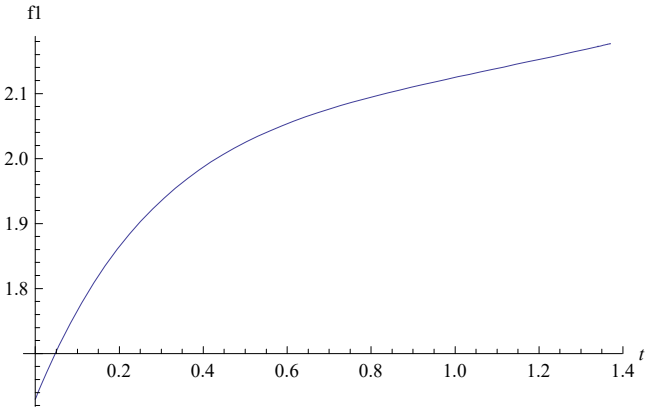
$$\begin{pmatrix} Vc \to -\frac{-2\,Vmx\,Cos[fi3]+Vmy\,Cos[fi3]-Vmx\,Sin[fi3]-2\,Vmy\,Sin[fi3]}{2\,Cos[fi3]+Sin[fi3]} \\ om1 \to -\frac{2\,Vmx\,Cos[fi2]\,Cos[fi3]+Vmx\,Cos[fi2]\,Sin[fi3]+2\,Vmy\,Cos[fi2]\,Sin[fi3]+Vmy\,Sin[fi2]\,Sin[fi3]}{r1\,(Cos[fi2]\,Sin[fi1]-Cos[fi1]\,Sin[fi2])\,(2\,Cos[fi3]+Sin[fi3])} \\ om2 \to \frac{2\,Vmx\,Cos[fi1]\,Cos[fi3]+Vmx\,Cos[fi1]\,Sin[fi3]+2\,Vmy\,Cos[fi1]\,Sin[fi3]+Vmy\,Sin[fi1]\,Sin[fi3]}{r2\,(Cos[fi2]\,Sin[fi1]-Cos[fi1]\,Sin[fi2])\,(2\,Cos[fi3]+Sin[fi3])} \\ om3 \to \frac{Vmy}{r3\,(2\,Cos[fi3]+Sin[fi3])} \end{pmatrix}$$

Out[29]= при t=0

Out[30]//MatrixForm=

$$\begin{pmatrix} Vc \to -1.72172 \\ om1 \to 1.61347 \\ om2 \to -0.0505045 \\ om3 \to -0.402246 \end{pmatrix}$$

Out[35]=



Out[37]=