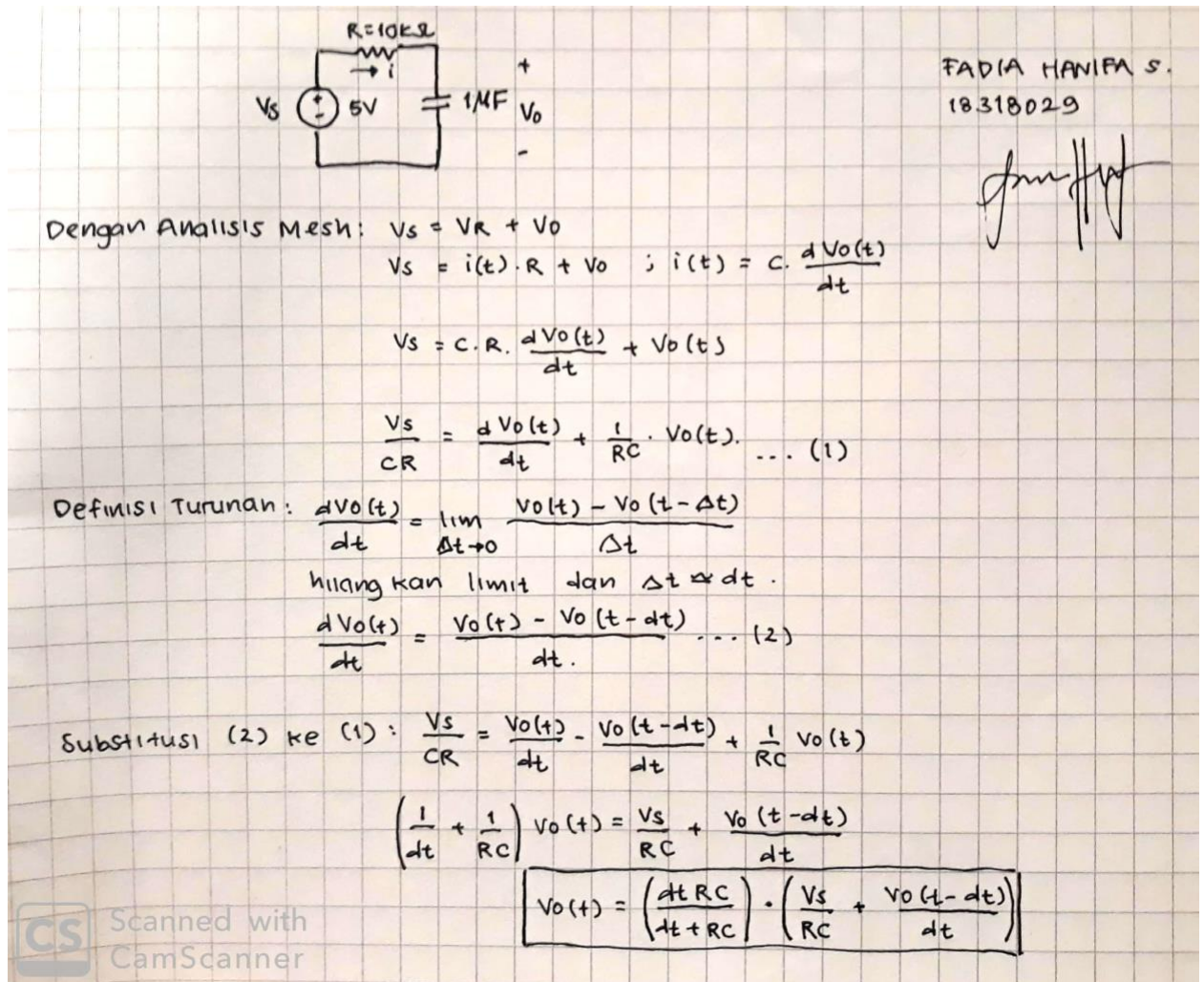


LAPORAN QUIZ 4

EL 2008 PENYELESAIAN MASALAH DENGAN C

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1. Penurunan Persamaan



The handwritten solution on grid paper shows a circuit diagram of a 5V DC voltage source V_s in series with a resistor $R = 10\text{ k}\Omega$ and a capacitor $C = 1\text{ nF}$. The current i flows clockwise. The voltage across the capacitor is V_o .

Using Mesh Analysis: $V_s = V_R + V_o$
 $V_s = i(t) \cdot R + V_o$; $i(t) = C \cdot \frac{dV_o(t)}{dt}$

$$V_s = C \cdot R \cdot \frac{dV_o(t)}{dt} + V_o(t)$$
$$\frac{V_s}{CR} = \frac{dV_o(t)}{dt} + \frac{1}{RC} \cdot V_o(t) \dots (1)$$

Definisi Turunan: $\frac{dV_o(t)}{dt} = \lim_{\Delta t \rightarrow 0} \frac{V_o(t) - V_o(t - \Delta t)}{\Delta t}$
hilangkan limit dan $\Delta t \approx dt$.

$$\frac{dV_o(t)}{dt} = \frac{V_o(t) - V_o(t - dt)}{dt} \dots (2)$$

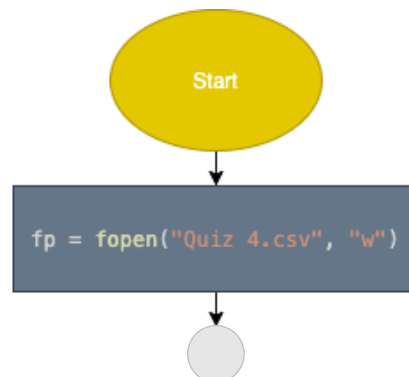
Substitusi (2) ke (1): $\frac{V_s}{CR} = \frac{V_o(t) - V_o(t - dt)}{dt} + \frac{1}{RC} V_o(t)$

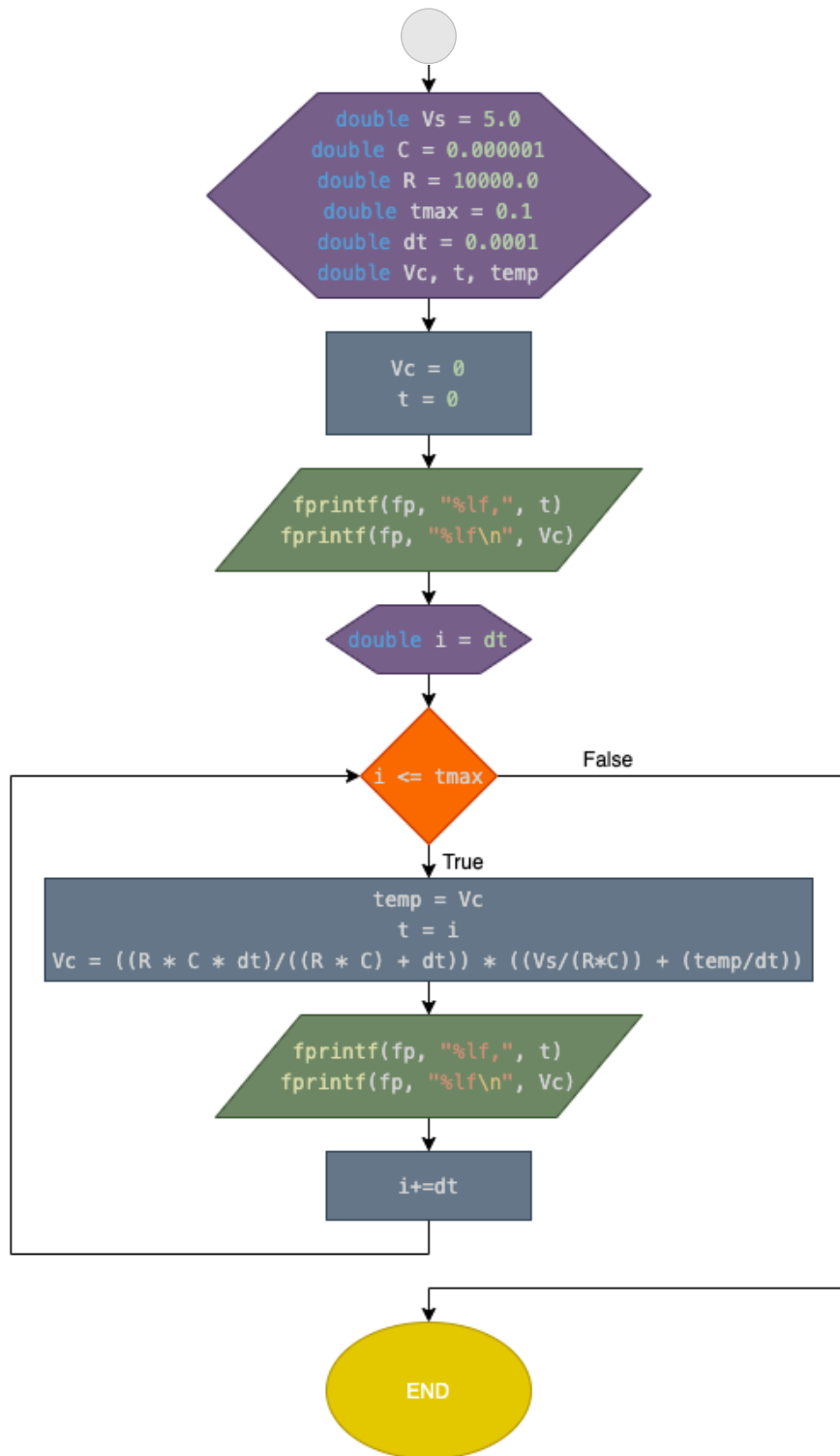
$$\left(\frac{1}{dt} + \frac{1}{RC} \right) V_o(t) = \frac{V_s}{RC} + \frac{V_o(t - dt)}{dt}$$
$$V_o(t) = \left(\frac{dt RC}{dt + RC} \right) \cdot \left(\frac{V_s}{RC} + \frac{V_o(t - dt)}{dt} \right)$$

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2. Flowchart





3. Kode

```
#include <stdio.h>

int main() {
    // inisiasi file
    FILE *fp;
    fp = fopen("Quiz 4.csv", "w");           // open or create csv file

    // inisiasi variabel
    double Vs = 5.0;
    double C = 0.000001;
    double R = 10000.0;
    double tmax = 0.1;
    double dt = 0.0001;
    double Vc, t, temp;

    // Hitung Vc
    Vc = 0;                                // Vc awal diketahui 0
    t = 0;
    fprintf(fp, "%lf,", t);                 // input data ke file external
    fprintf(fp, "%lf\n", Vc);
    for(double i = dt; i <= tmax; i += dt) { //looping dari t=dt sampai t=tmax
        temp = Vc;                          // menyimpan data Vc(t-dt)
        t = i;                              // menyimpan data t
        Vc = ((R*C*dt)/((R*C)+dt))*((Vs/(R*C))+(temp/dt)); // perhitungan Vc
    }
```

4. Grafik Hasil

