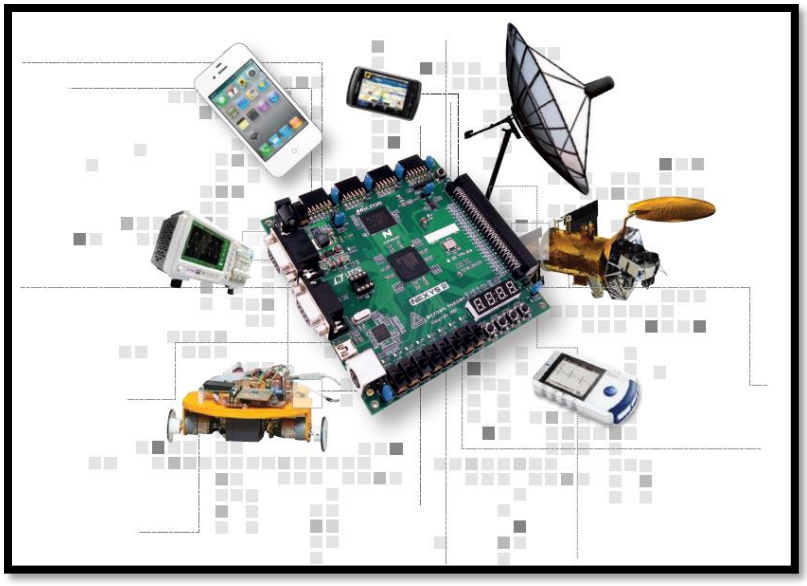
21-4-2024

Tarea 8

Sistemas embebidos



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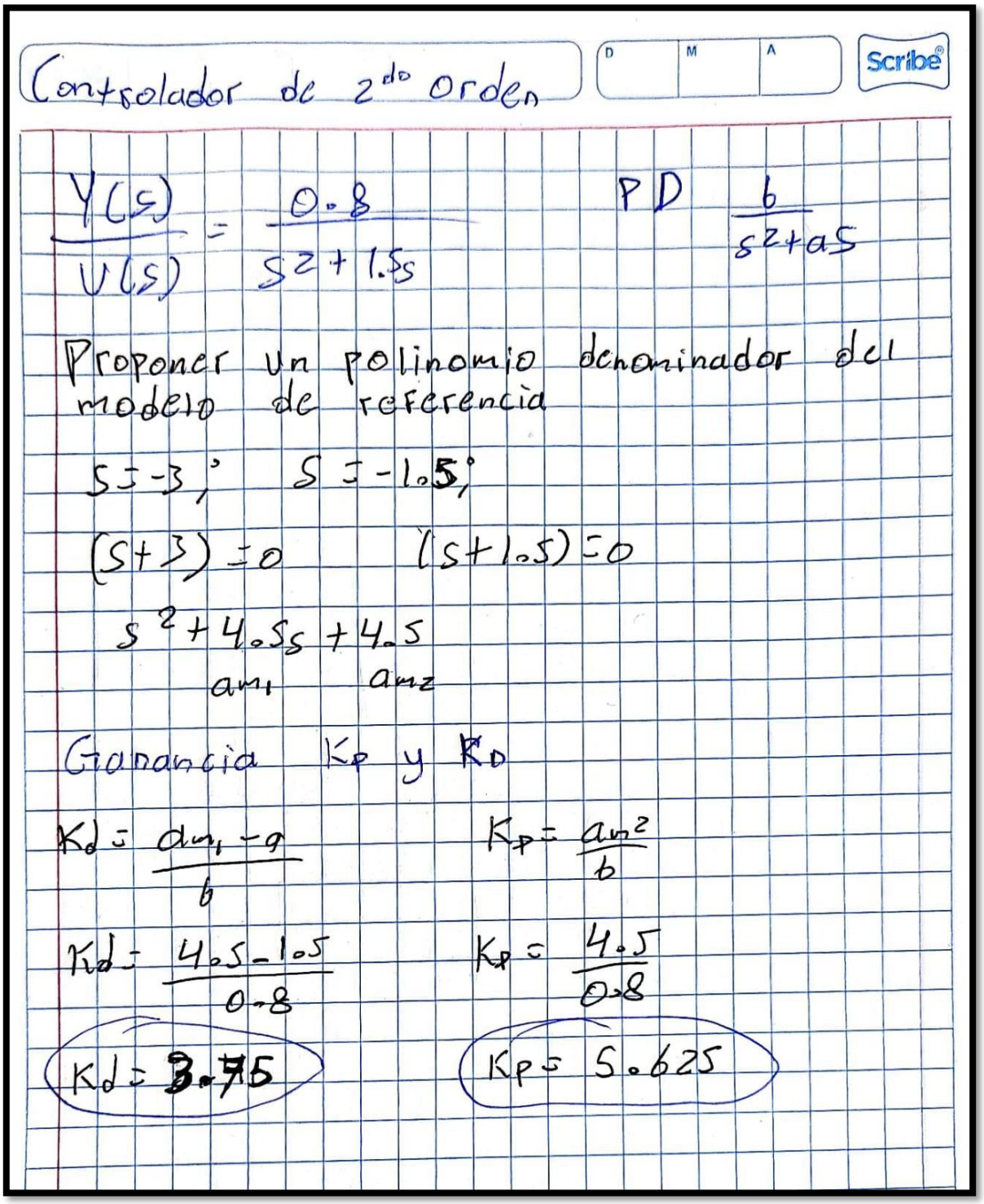
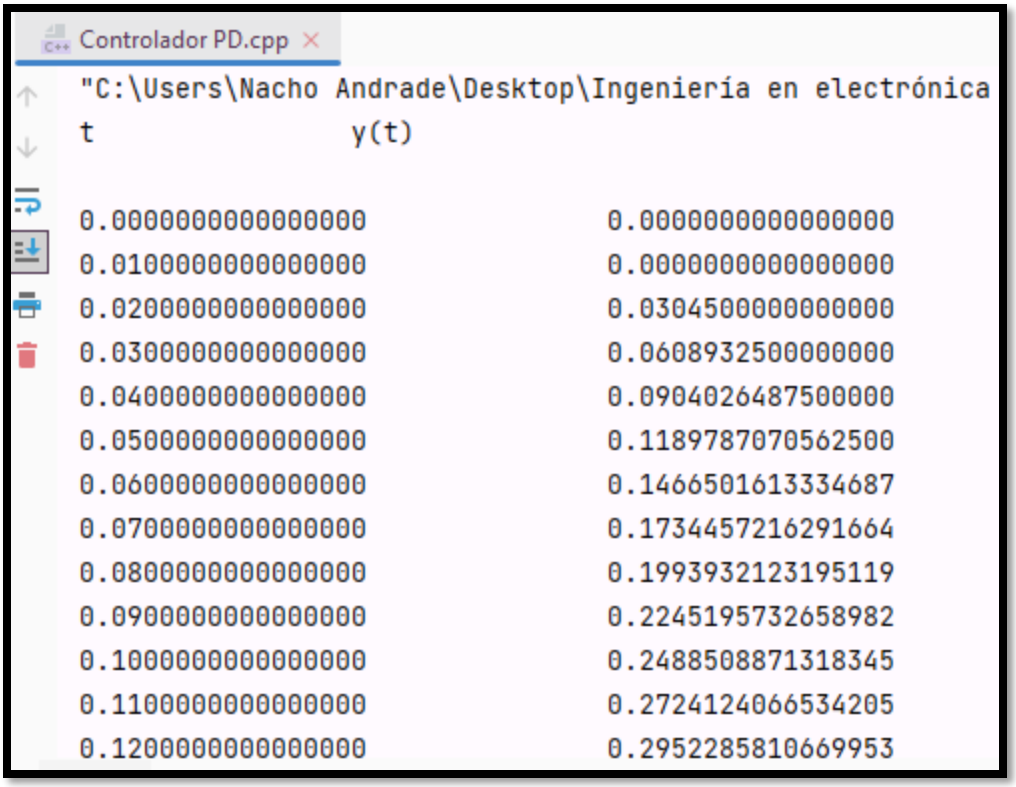
Controladores



Código en C++

```c
// Online C compiler to run C program online
#include <stdio.h>
#include <math.h>

int main() {
    // Write C code here
    //Tiempo de simulación
    double tfin = 10;
    double h=0.01;
    int n = tfin/h;
    double y[n], u[n], t[n];
    //Parametros de planta
    double a= 1.5, b=.8;
    //Parametros de controlador
    double kp= 5.625, kd= 3.75;
    double ref = 1, e, e_1=0;

    printf("t \t\t y(t) \n\n");
    for (int i = 0; i<n; i++){
        //Vector de tiempo
        t[i] = i*h;

        //controlador
        e = ref-y[i];
        u[i]= kp*e+kd*(e-e_1)/h;
        e_1 = e;

        //planta
        y[i+2] = 2*y[i+1]-y[i]-a*h*(y[i+1]-y[i])+b*h*h*u[i];

        //Resultados
        printf("%0.16f \t\t %0.16f \n", t[i], y[i]);

    }
    return 0;
}
```

Salida en C++


Controlador PD.cpp
"C:\Users\Nacho Andrade\Desktop\Ingeniería en electrónica
t y(t)
0.0000000000000000 0.0000000000000000
0.0100000000000000 0.0000000000000000
0.0200000000000000 0.0304500000000000
0.0300000000000000 0.0608932500000000
0.0400000000000000 0.0904026487500000
0.0500000000000000 0.1189787070562500
0.0600000000000000 0.1466501613334687
0.0700000000000000 0.1734457216291664
0.0800000000000000 0.1993932123195119
0.0900000000000000 0.2245195732658982
0.1000000000000000 0.2488508871318345
0.1100000000000000 0.2724124066534205
0.1200000000000000 0.2952285810669953

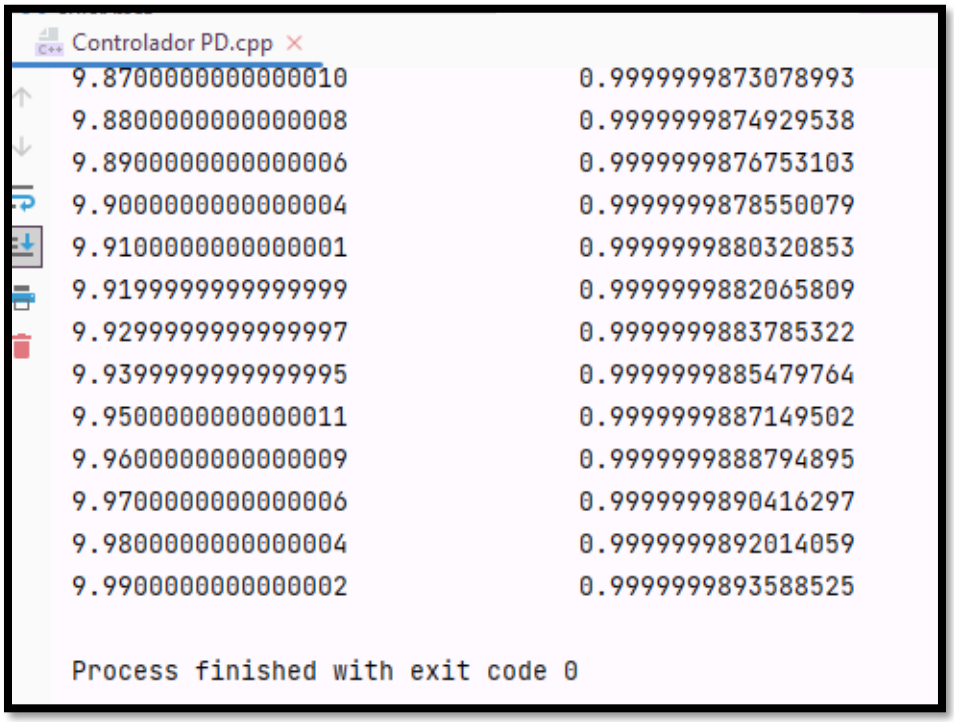
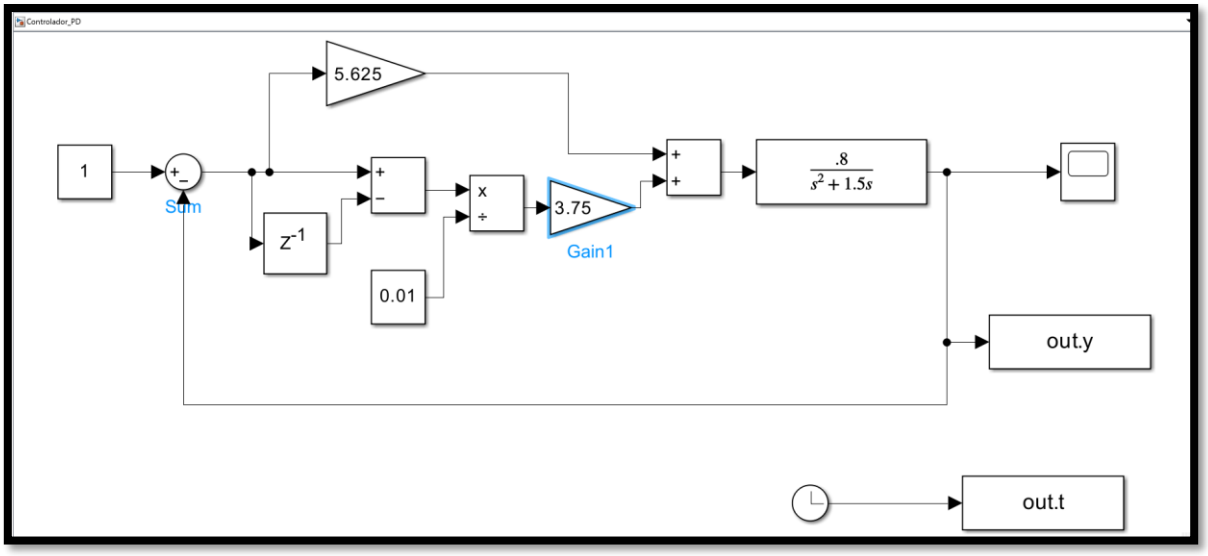
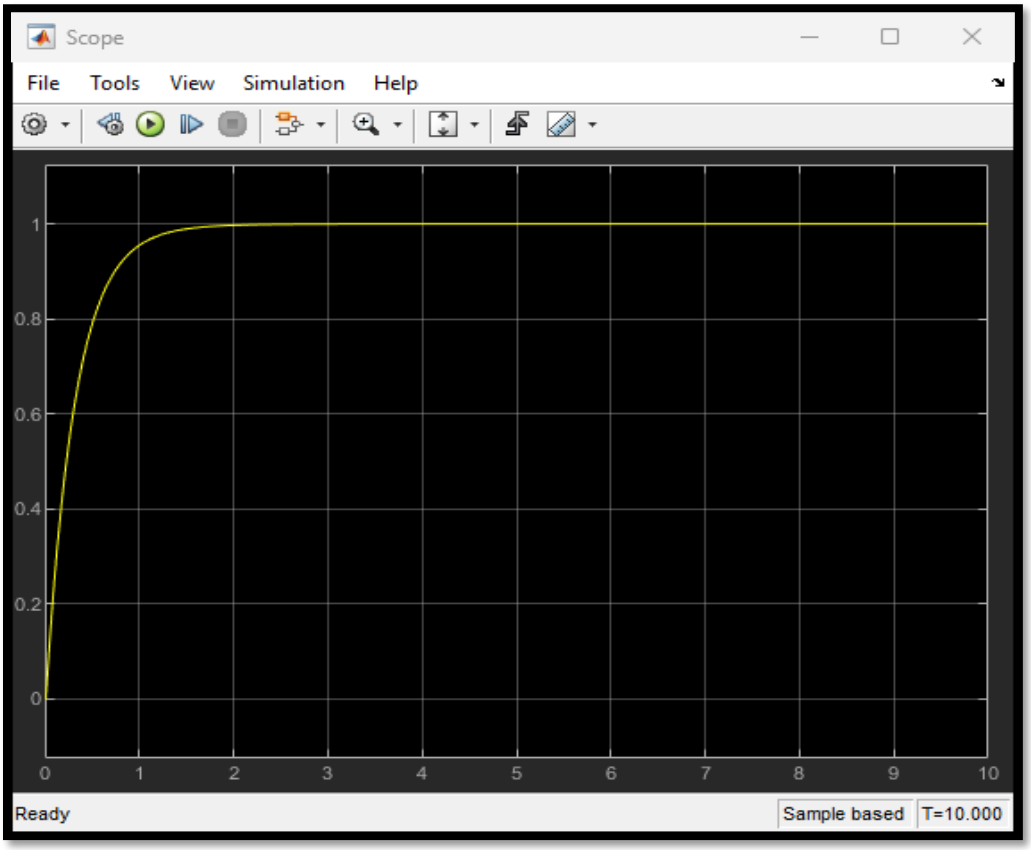

Controlador PD.cpp
9.8700000000000010 0.9999999873078993
9.8800000000000008 0.9999999874929538
9.8900000000000006 0.9999999876753103
9.9000000000000004 0.9999999878550079
9.9100000000000001 0.9999999880320853
9.9199999999999999 0.9999999882065809
9.9299999999999997 0.9999999883785322
9.9399999999999995 0.9999999885479764
9.9500000000000011 0.9999999887149502
9.9600000000000009 0.9999999888794895
9.9700000000000006 0.9999999890416297
9.9800000000000004 0.9999999892014059
9.9900000000000002 0.9999999893588525
Process finished with exit code 0

Diagrama de simulink



Grafica saliente



Salida en Matlab

Command Window

```
>> disp([out.t,out.y]);
                   0                   0
   0.010000000000000                   0
   0.020000000000000   0.030450000000000
   0.030000000000000   0.060893250000000
   0.040000000000000   0.090402648750000
   0.050000000000000   0.118978707056250
   0.060000000000000   0.146650161333469
   0.070000000000000   0.173445721629166
   0.080000000000000   0.199393212319512
   0.090000000000000   0.224519573265898
   0.100000000000000   0.248850887131835
   0.110000000000000   0.272412406653421
   0.120000000000000   0.295228581066996
   0.130000000000000   0.317323081695725
   0.140000000000000   0.338718826721137
   0.150000000000000   0.359438005165542
   0.160000000000000   0.379502100110494
   0.170000000000000   0.398931911175615
   0.180000000000000   0.417747576281362
```

Command Window

```
   9.830000000000000   0.999999986539890
   9.840000000000000   0.999999986736142
   9.850000000000000   0.999999986929533
   9.859999999999999   0.999999987120105
   9.870000000000001   0.999999987307897
   9.880000000000001   0.999999987492952
   9.890000000000001   0.999999987675309
   9.900000000000000   0.999999987855006
   9.910000000000000   0.999999988032084
   9.920000000000000   0.999999988206580
   9.930000000000000   0.999999988378531
   9.940000000000000   0.999999988547976
   9.950000000000001   0.999999988714950
   9.960000000000001   0.999999988879489
   9.970000000000001   0.999999989041630
   9.980000000000000   0.999999989201406
   9.990000000000000   0.999999989358853
  10.000000000000000   0.999999989514004
```