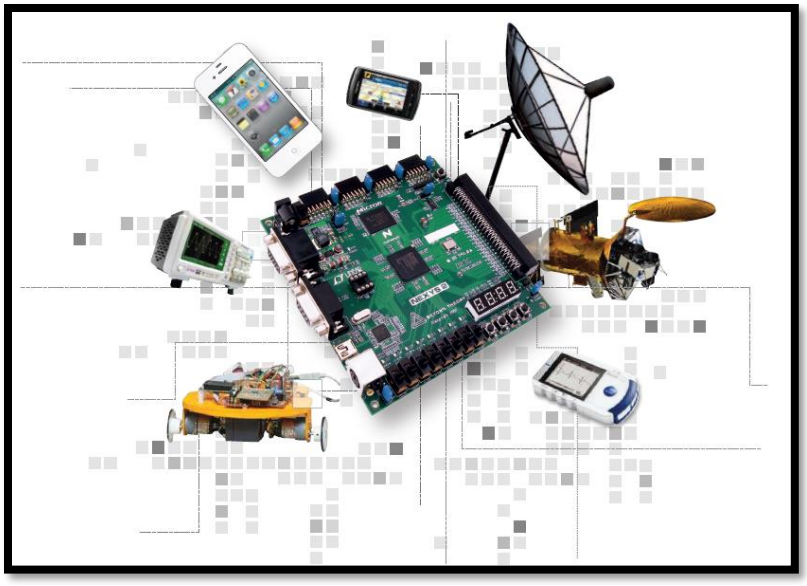
5-5-2024

# Tarea 11

## Sistemas embebidos



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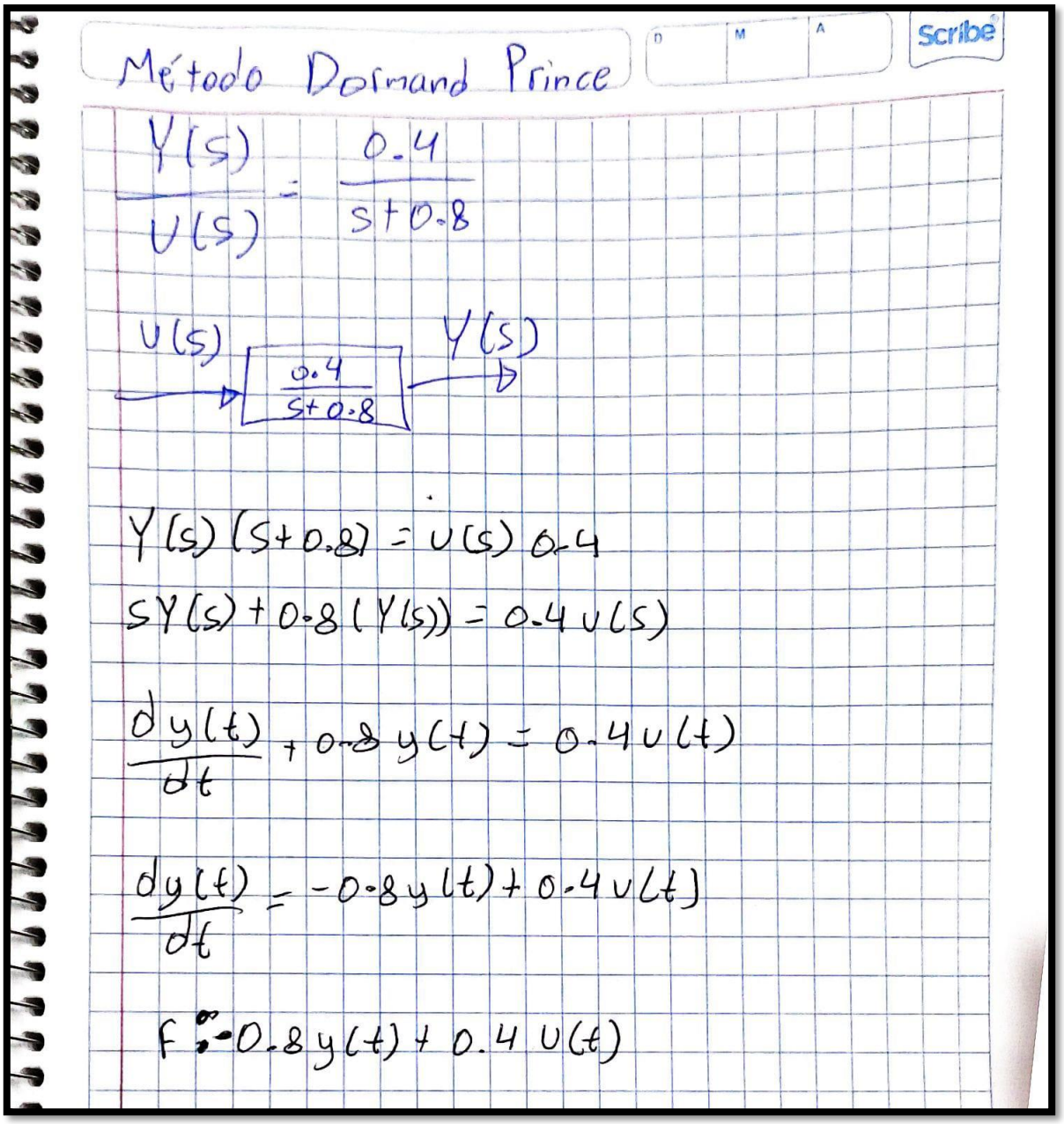
**Controlador PID**



## Código en C++

```c
#include <stdio.h>
#include <math.h>

double f(double z){
    return -5*z+6;
}

main(){

    double tfin =10;
    double h=0.01;
    int n=tfin/h;


    double y[n], t[n];


    printf( format: "t \t\t\t  y(t)\n\n");
    for (int i=0;i<n;i++){
        t[i]=i*h;

        double k1=h*f( z: y[i]);
        double k2=h*f( z: y[i]+k1/5);
        double k3=h*f( z: y[i]+(3*k1/40)+(9*k2/40));
        double k4=h*f( z: y[i]+44*k1/45+56*k2/15+32*k3/9);
        double k5=h*f( z: y[i]+19372*k1/6561+25360*k2/2187+64448*k3/6561-212*k4/729);
        double k6=h*f( z: y[i]+9017*k1/3168+355*k2/33+46732*k3/5247+49*k4/17-5103*k5/18656);

        y[i+1]=y[i]+35*k1/384+500*k3/1113+125*k4/192-2187*k5/6784+11*k6/84;

        printf( format: "%f \t\t%0.16f\n ",t[i],y[i]);
    }



    return 0;
}
```

**Salida en C++**

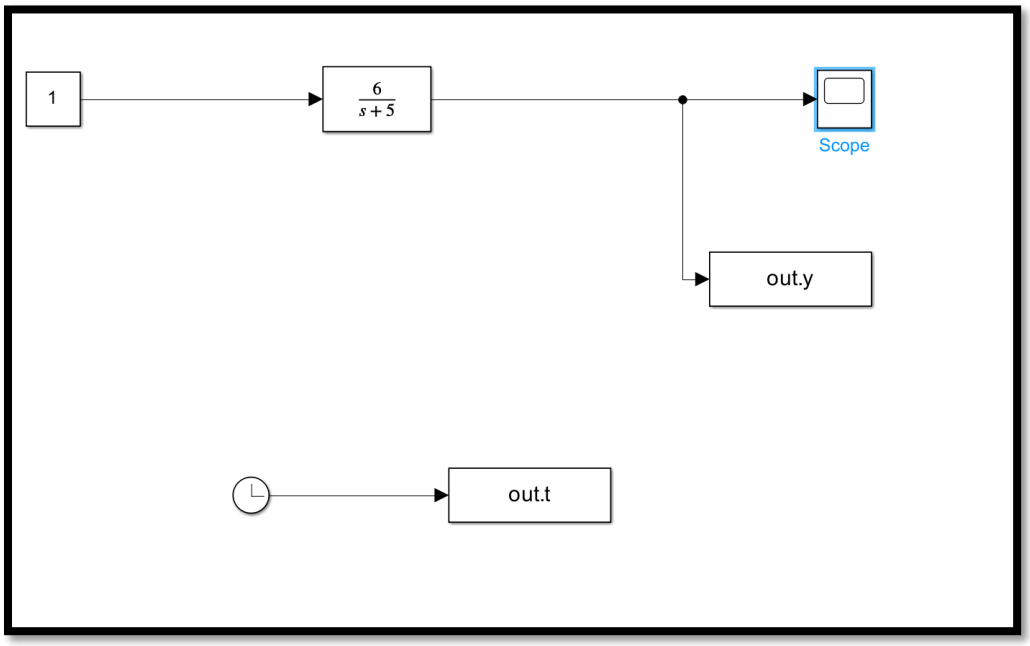
```
"C:\Users\Nacho Andrade\Desktop\IELC\7mo_semestre\Sistemas embebi
t                         y(t)

0.000000                  0.0000000000000000
 0.010000                 0.0573399588327602
 0.020000                 0.1119400252664016
 0.030000                 0.1639311203987338
 0.040000                 0.2134379094856010
 0.050000                 0.2605791008656489
 0.060000                 0.3054677306014809
 0.070000                 0.3482114335197197
 0.080000                 0.3889127012998823
 0.090000                 0.4276691282309152
 0.100000                 0.4645736452246728
 0.110000                 0.4997147426474597
 0.120000                 0.5331766825039460
 0.130000                 0.5650397004822364
 0.140000                 0.5953801983445579
 0.150000                 0.6242709271248869
 0.160000                 0.6517811615727886
 0.170000                 0.6779768662617554
 0.180000                 0.7029208537603382
 0.190000                 0.7266729352453429
 0.200000                 0.7492900639182291
 0.210000                 0.7708264715685997
 0.220000                 0.7913337986122390
 0.230000                 0.8108612179155013
 0.240000                 0.8294555527029641
 0.250000                 0.8471613888310641
```

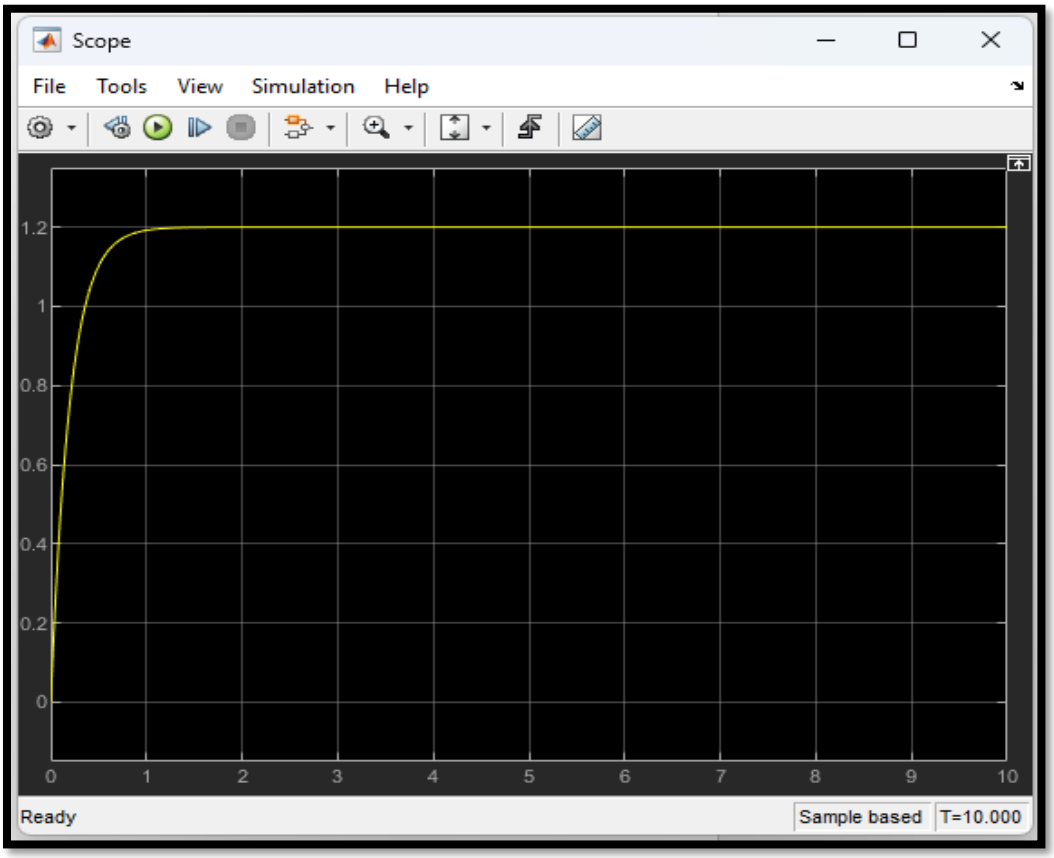
```
9.760000                1.1999999999999953
9.770000                1.1999999999999953
9.780000                1.1999999999999953
9.790000                1.1999999999999953
9.800000                1.1999999999999953
9.810000                1.1999999999999953
9.820000                1.1999999999999953
9.830000                1.1999999999999953
9.840000                1.1999999999999953
9.850000                1.1999999999999953
9.860000                1.1999999999999953
9.870000                1.1999999999999953
9.880000                1.1999999999999953
9.890000                1.1999999999999953
9.900000                1.1999999999999953
9.910000                1.1999999999999953
9.920000                1.1999999999999953
9.930000                1.1999999999999953
9.940000                1.1999999999999953
9.950000                1.1999999999999953
9.960000                1.1999999999999953
9.970000                1.1999999999999953
9.980000                1.1999999999999953
9.990000                1.1999999999999953

Process finished with exit code 0
```

## Diagrama de simulink




## Grafica saliente



## Salida en Matlab

```
>> disp([out.t,out.y]);
                   0                   0
   0.010000000000000   0.058525000000000
   0.020000000000000   0.114195686979167
   0.030000000000000   0.167151268162120
   0.040000000000000   0.217524161521130
   0.050000000000000   0.265440326893610
   0.060000000000000   0.311019580950736
   0.070000000000000   0.354375896804785
   0.080000000000000   0.395617689004368
   0.090000000000000   0.434848084630217
   0.100000000000000   0.472165181169398
   0.110000000000000   0.507662291812782
   0.120000000000000   0.541428178789163
   0.130000000000000   0.573547275319466
   0.140000000000000   0.604099896746073
   0.150000000000000   0.633162441365187
   0.160000000000000   0.660807581464439
   0.170000000000000   0.687104445043433
   0.180000000000000   0.712118788671628
   0.190000000000000   0.735913161915788
   0.200000000000000   0.758547063748187
   0.210000000000000   0.780077091326635
   0.220000000000000   0.800557081518392
   0.230000000000000   0.820038245521839
   0.240000000000000   0.838569296922534
   0.250000000000000   0.856196573503875
   0.260000000000000   0.872964153116946
   0.270000000000000   0.888913963899305
   0.280000000000000   0.904085889118300
   0.290000000000000   0.918517866901092
   0.300000000000000   0.932245985100771
   0.310000000000000   0.945304571535752
   0.320000000000000   0.957726279828144
   0.330000000000000   0.969542171055692
   0.340000000000000   0.980781791421496
   0.350000000000000   0.991473246135711
   0.360000000000000   1.001643269693967
   0.370000000000000   1.011317292728267
   0.380000000000000   1.020519505597499
```

| | |
|---|---|
| 9.660000000000000 | 1.199999999999998 |
| 9.670000000000000 | 1.199999999999998 |
| 9.680000000000000 | 1.199999999999998 |
| 9.690000000000000 | 1.199999999999998 |
| 9.700000000000001 | 1.199999999999998 |
| 9.710000000000001 | 1.199999999999998 |
| 9.720000000000001 | 1.199999999999998 |
| 9.730000000000000 | 1.199999999999998 |
| 9.740000000000000 | 1.199999999999998 |
| 9.750000000000000 | 1.199999999999998 |
| 9.760000000000000 | 1.199999999999998 |
| 9.770000000000000 | 1.199999999999998 |
| 9.779999999999999 | 1.199999999999998 |
| 9.790000000000001 | 1.199999999999998 |
| 9.800000000000001 | 1.199999999999998 |
| 9.810000000000000 | 1.199999999999998 |
| 9.820000000000000 | 1.199999999999998 |
| 9.830000000000000 | 1.199999999999998 |
| 9.840000000000000 | 1.199999999999998 |
| 9.850000000000000 | 1.199999999999998 |
| 9.859999999999999 | 1.199999999999998 |
| 9.870000000000001 | 1.199999999999998 |
| 9.880000000000001 | 1.199999999999998 |
| 9.890000000000001 | 1.199999999999998 |
| 9.900000000000000 | 1.199999999999998 |
| 9.910000000000000 | 1.199999999999998 |
| 9.920000000000000 | 1.199999999999998 |
| 9.930000000000000 | 1.199999999999998 |
| 9.940000000000000 | 1.199999999999998 |
| 9.950000000000001 | 1.199999999999998 |
| 9.960000000000001 | 1.199999999999998 |
| 9.970000000000001 | 1.199999999999998 |
| 9.980000000000000 | 1.199999999999998 |
| 9.990000000000000 | 1.199999999999998 |
| 10.000000000000000 | 1.199999999999998 |