## VASAVI COLLEGE OF ENGINEERING

(Affiliated to Osmania University) Hyderabad - 500 031.

DEPARTMENT OF

NAME OF THE LABORATORY : CIL

Name Gr-Sri Granga Paanav Roll No. 1602-51-925-117 Page No.

Effect of controllers on and order systems

Ain: to analyse the effect of PI, PP, PID controllers on second order systems.

tools Required: - A PC loaded with MATLAB PRUPERIOR OFF WEIGHTER COMPOSITE

Theory :-

controllers are particularly significant in second-order systems within control systems engineering due to their ability to regulate system response characteristics such as damping, settling time, and oversenvot. In second order system, which are common in engineering applications, controllers can adjust parameters like gain and phase to stabilite the system, improve its performance, and ensure its responds appropriately to disturbances by tuning the controller, engineers can fine-tune the system's neeponse to med specific nequirements, such as minimizing overshoot or reducing settling time, thus optimizing the overall system per formance

Program:-

% PID controller

clear,

close all;

5=tf(181);

d= +: 0.01:3;

a) Design a PTD controller for a system with OLTF Gr(s) = 100 to meet the following specifications;

(i) closed loop dominant pole at s= 411

(ii) steady state error for unit ramp input less than 0.05

The Am Told (A)

```
PJD controlles :-
                (nets) = Kpf Kd &+ KI
                 G18) = 100
                                              (8+1)(8+5)(8+20)
                  sd = -493 ess = 0.05 for ramp ilp
                              kv=1 = 20
                                 My rould to
            OLTF after introducing PID controller
                            Cr((5) Cr(5) = \( \frac{100}{(5+1)(5+5)(5+20)} \) [Kp+kd5+KI]
                                 KV 0 = Ut & Crisi = lt 100 (814p +8 + 16d + 12)
    8-0 (St1) (5t5) (8t20)
    5-X20 = 20 MIN 1
        West & Marie Marie
 B=180-Tan (4) = 20
          = 180+14°=166° NAMED PARTE STATE AND STATE OF THE STATE O
                                   ) = 100 policy busy busy on the one of the
                                         1-4-5+1) (-4+j+5) (-4+j+20)
[Cr(S=Sd)] = 100 = 1-39 11 = 1-39
                                                                  JOJE JE 7 157 1101
         Q = (cred) = - Tami (-1) - Tami (-1) - Tami (-1) = -30.1°
                 kp = -sin(\phi f \beta) - 2 CI COSP
   la sall sing sall = 7-35
                  kd = 89n (180°-ф) + KI = 0.816
                                             [Crisd][sd] sin B 18012
```

## VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS) (Affiliated to Osmania University) DEPARTMENT OF : E(E

NAME OF THE LABORATORY : CSE

Name Gast branga Pranav Roll No. 1602-31-735-117 Page No.

gs= 100/((s+1) & (s+5) a (s+20)); gpid = ((7-369-5)+20+10-51646495))/3; g = series(gs,gpid). eltf = feedback (g,1); esim (cittia,t) figure pamap(cttf)

de; clear; close all; s=tf('s');

A LON XOLD STATE OF THE PARTY O 7, PD controller 1 @ Design a PD controller for a system with OLTF Cres) = 10 8(3+1)(3+5) closed loop dominant poles at S=-1.5 ±j(1.2)

111 - 80 1186

OF THEFT

gs = 10#(+1+0-7645)/(8#(-8+5)#(-8+1)); clt + = feedback (gs, 1); 3 m (10 10) (12) pamap(dtf) figure

%PI controlleg

a) Design a PI controller for a system with OLTF (313) = 10 to get closed loop transper bunction at s=-2 ± i(1.2)

PD controller: Consider Sd = -1.5+3(1.2) \$ > Peal Gre(3) = Kp+Kds B = 180°-70m-1(1-2) = 180°-70m-1(4) = 141.30 For PD controller, G(Sd) = 10 (-1.5+1-2j)(-1.5+1-2j+1)(-1.5+1.2j+5) 16(Sd) = 16 CONTROLL STA N1.52+1.22 JO-52+1022 J352+1.22 CATH IN USA = 10 1.92 X 1-3 X3-7 -1.08  $\Phi = (0, 13d) = -1 \text{ and } \left(\frac{12}{-1.5}\right) - 1 \text{ and } \left(\frac{1.2}{-0.5}\right) - 1 \text{ and } \left(\frac{1.2}{3.5}\right)$ =87.115° the of less much part at Kp=-sinlofB) =101 (cresd) lang Kd = sin (180-B) Isd/Crisa) long = 0-76 albit to the OLTFafter cascading controller = Grls)-Grc(s) =10 (1-140-761) SLS41) (345)

> CLIF = OLTF HOLTF

## VASAVI COLLEGE OF ENGINEERING

(Affiliated to Osmania University)
Hyderabad - 500 031.

DEPARTMENT OF

ECE

NAME OF THE LABORATORY : CSE

Name Cr-Sri tranga Pranav Roll No. 1602-21-735-117 Page No.

clear; close all; &=tf('s');

96 = 100 (0,74+1.63/8)/(1+5)-0(1+12);

eltf = feedback (gr, 1);

88gu

<u>Result</u>: Designed PJP, PI and PD controllers for the given specifications.

Elle Jan ( F. ) mar- ( E. ), mus - 3

abill : 58.13, 51

CHAIRE MAL

The gratewarth

Eg. 1 = Eg (2 birg 1 - 60 E - 10 to

DE-O-14 C - MOTOR SPORTS - SAME CONTRACTOR - LA

tures apply the continue (des) on 19- in long

(315)((355)

ALCON LE

```
67(3) - KP
   Pa controlless-
     Cula) = FP+KI
     Consider -2+3(1-2)=5d
        B = 180° - 9am (1-2)
           = 149:020
     Golsd ) = 20
             (-2+2+1·2j)(-2+1-2j+5)
             - 10
                                                  (21)07 10 1151
           1-21 (3+1-25)
      |G(Sd)| = \frac{10}{1-2 \times \sqrt{3^2+1.5^2}} = 2-57
       $ = LCs (sd)
         = 2 \text{Cr}(\text{Sd})
= -7 \text{cm}^{-1} \left(\frac{1-2}{3}\right) - 7 \text{cm}^{-1} \left(\frac{1-2}{3}\right)
          = -90°-21-8° = -111-8°
     for PI controller Kd=0
      Kd = sin (180°-p) + KI
         (Sd) (Glad) sing 18d)2
            0 = -7-02 + KI = 1.63
      *P= -sin ( 9+B)
               Urlid) Ising - 2 LI COSP = 15d) > Kp=0-74
OLTF after adding PI controller = Cris ) Crc(3) = 10 (0-74+1-63)
                                                       (3+2)(3+5)
     CLIF = OLTF
                 1-1 OLTF
```