明新科技大學九十四學年度研究所碩士班 [V]一般生 □在職生 考試入學試題卷

所別	科目	准考證號碼(請考生填入)	考試日期	節次	第 1 頁/共 1 頁
精密機電工程研究所	自動控制		94年5月1日	第二節	

1. Find the transfer function, $G(s)=X_1(s)/F(s)$, for the translational mechanical system shown in Figure 1, where M_1=1 kg, M_2=2 kg, K_1=2 N/m, K_2=3 N/m, D=2 N-s/m. (20%)

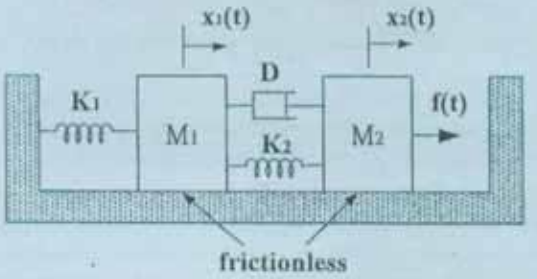

Figure 1

2. Give the unity feedback system of Figure 2 with $G(s)=\dfrac{K}{s(s+1)(s+2)(s+5)}$.

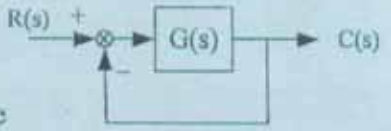

Figure 2

   (1) Use the Routh-Hurwitz criterion to determine the rang of K that keeps the system stable.(8%)
   (2) Use the Routh-Hurwitz criterion to find the value of K that will cause the system to be marginally stable.(7%)
   (3) Sketch the root locus for this system, where K is from 0 to $+\infty$. (10%)

3. For the system shown in Figure 3.
   (1) Find the position constant (K_p), velocity constant (K_v), and acceleration constant (K_a). (9%)
   (2) Find the steady-state errors for inputs of 6 u(t), 6 tu(t), and 6 t^2u(t). The function u(t) is the unit step. (6%)
   (3) State the system type. (5%)

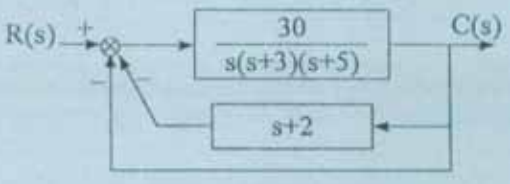

Figure 3.

4. For the feedback control system shown in Figure 4.
   (1) Design the values K_1 and K_2 to yield a damping ratio of 0.6 and a natural frequency of 8 rad/s.
   (2) Find the peak time and the settling time for the conditions and a unit step input. (20%)

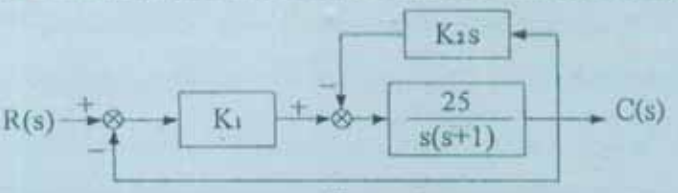

Figure 4.

5. Given the closed-loop system of Figure 5 with the forward-path transfer function $G(s)=\dfrac{20(s+5)}{s(s+1)(s+10)}$. Draw the Bode plots including both log-magnitude and phase plots. (15%)

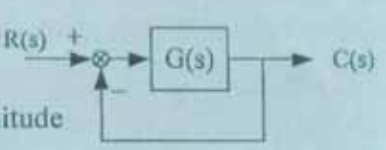

Figure 5