1. You are supposed to buy a plotter system, give and explain your decision making based on time-domain justification. (15%)

2. Use time-domain equation to express the condition of causality in input-output model. (10%)

3. Give the stability condition of the parameter set {a,b,c,d} for the following dynamic system

$$ax''' + bx'' + cx' + dx = f(t)$$

where f(t) is a time function of D.C. and A.C. components. (10%)

4. A unity feedback system with transfer function 1/s(s+1) is controlled by a proportional controller. Plot the root locus and determine the condition when there is no oscillation in impulse response. (15%)

(背面仍有題目,請繼續作答)

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5.) (a) Try to plot a bode-plot of the following control system

R(s) →○→ [$\dfrac{2500(s+1)}{s(s+2)(s^2+30\ s\ +2500)}$] → C(s) (12%)
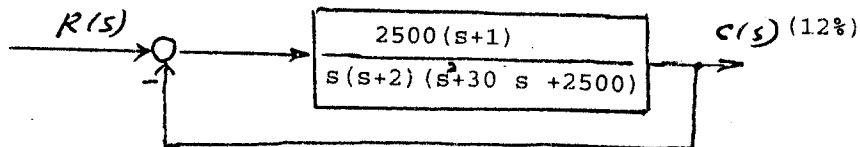
(b) According to the result of (a), can you decide whether the system stable or not? why?　(8%)

(c) If you want to have phase margin $45°$, how do you design?　(5%)

6.) (a) Try to plot the complete Nyquist diagram of the following transfer function of a plant ?　(9%)

(b) Using the Nyquist criterion to judge and explain whether the control system is stable or not? why?

(9 %)

$$G(s) = \frac{11.7}{s(0.05s+1)(0.1s+1)}$$

7.) In the following diagram, if the force input to the mass spring system, is f(t), the output is y(t), d and k are the damping coeffient and spring constant, respectively.

(a) express the system with state space model,

$$\dot{X} = \underline{A}\ \underline{X} + \underline{B}\ \underline{U}$$

$$y = \underline{C}\ \underline{X} + \underline{D}\ \underline{U}$$

find the constant matrix $\underline{A}$, $\underline{B}$, $\underline{C}$, $\underline{D}$?　(5 %)

(b) using the above state space model, find the characteritic equation of the system ?

(2 %)