國立彰化師範大學 98 學年度碩士班招生考試試題

系所：車輛科技研究所　　科目：（甲）自動控制

☆☆請在答案紙上作答☆☆　　

1. Obtain the transfer function Y(s)/X(s) of the system shown in Figure 1. (20%)

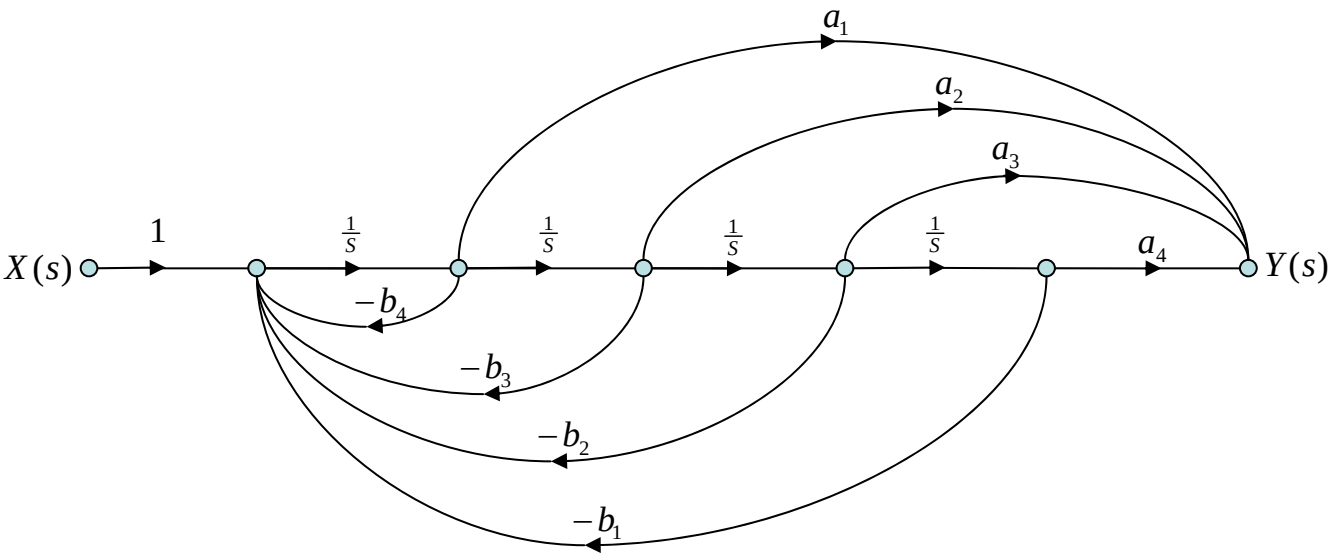

Figure 1. Problem #1.

2. (a) Write the moment equations of the linear system shown in Figure 2 in terms of θ_i, J_i, T_i, k_j, and d_j (i=1,2,3; j=1,2), where θ_i and T_i are the angle displacement and the torque applied to each object in the specified direction, J_i, k_j, and d_j are the moment inertial, the torsional spring constant (stiffness), and the torsional viscous frictional coefficient between objects, respectively. (15%)

   (b) Write the state equation of this system. (5%)

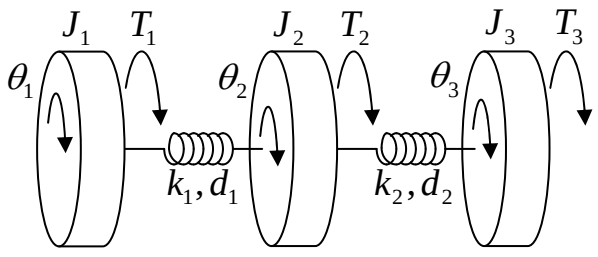

Figure 2. Problem #2.

3. State the following terminologies (a) Controllability (5%); (b) Observability (5%); (c) Critically damped system (5%); (d) Transfer function (5%).

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4. Using Routh stability criterion to find the range of K for stability of the characteristic equation $s^4 + 2s^3 + (4+K)s^2 + 9s + 25 = 0$. (20%)

5. Find the range of K for stability of a unity feedback control system whose open-loop transfer function is $G(s) = \dfrac{K}{s(s+1)(s+2)}$. (20%)