淡江大學八十七學年度碩士班入學考試試題

系別： 電機工程學系　　科目： 控制系統

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1. Block diagram of a system is shown in Fig. 1a. Represent the system in the form given in Fig. 1b and Fig. 1c. Determine G(s) and H(s).(20%)

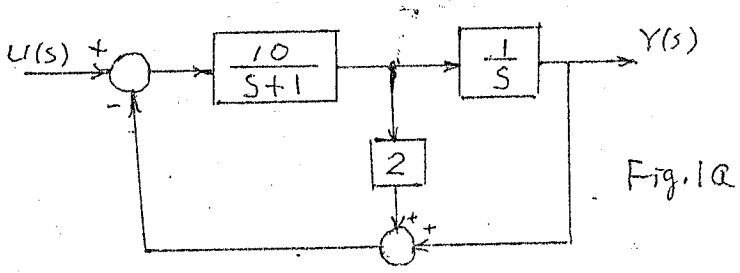

Fig. 1a

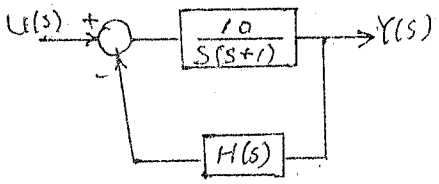

Fig. 1b

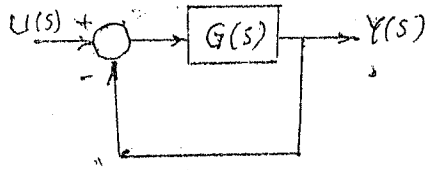

Fig. 1c

2. Consider the system shown in Fig. 2. (20%)
   a) Obtain the state equation and the output equation in matrix form.
   b) Determine the transfer function of the system from the related matrices obtained in a).
   c) Draw the signal flow graph of the system.
   d) Obtain the transfer function by using Mason's equation.

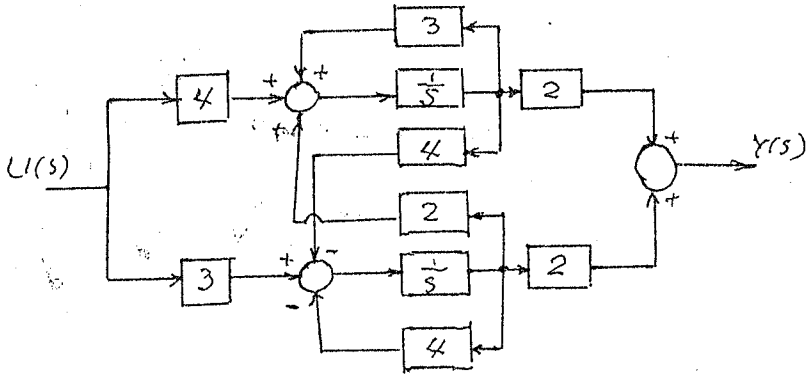

Fig. 2

可帶計算機

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3. From the signal flow graph shown in Fog. 3. (20%)
   a) Determine the unit impulse , the unit step and zero-input responses.
   b) Assume that the step response has an initial magnitude of 1/4 and a time constant of 5 seconds, find a and k actually used.

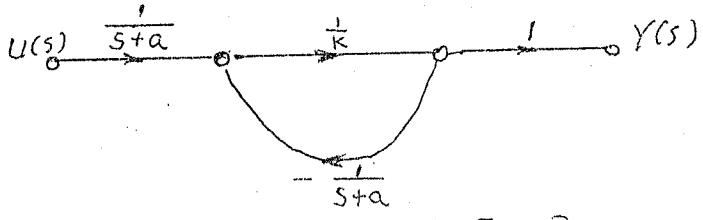

Fig. 3

4. The disk storage data head positioning system is shown in Fig. 4, k and a are parameters of the system . Determine the range of k and a for which the system is stable. (20%)

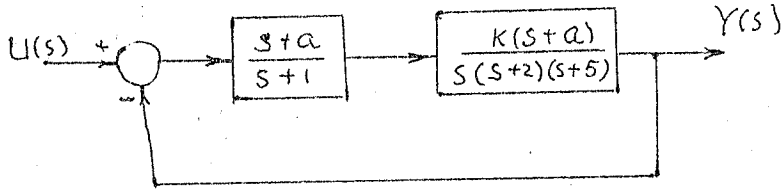

Fig. 4

5. Consider the linear process that has transfer function (20%)

$$\frac{Y(s)}{U(s)} = \frac{100}{s(s+5)}$$

   a) Describe the system in state space re[resentation.
   b) Design a state feedback control given by

$$u = r - GX, \qquad G = [g_1 \;\; g_2]$$

   with eigenvalue of the closed-loop system located at $\lambda = -7.07 \pm j7.07$, the natural undamped frequency is 10 rad/sec and the corresponding damping ratio is 0.707.