淡江大學 99 學年度碩士班招生考試試題

54-1

系別：機械與機電工程學系　　科目：自　動　控　制

准帶項目請打「V」	
✓	計 算 機

本試題共 2 頁，4 大題

本試題雙面印製

(1) (a)What is the PID controller of a control system? (5%)
(b)What is the break frequency of a Bode plot? (5%)

(2) (a) Please determine the transfer function and the state equation of the mechanical system (Fig. 1(a)). The applied force is 2 lb (**step input**). (20%)
(b) Determine the value of the spring constant ***k*** and the damping ratio of this system from Fig. 1(b). The displacement ***x*** is measured from the equilibrium position. (10%)

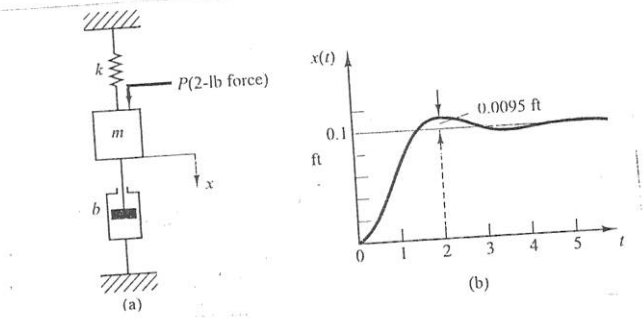

Fig. 1 Mechanical system and its step-response.

(3) A unit feedback system is shown in figure 2.
(a) Sketch the root locus. (10%)
(b) Find the breakaway and entry points on the real axis. (10%)
(c) Find the gain and the roots when the real part is located at -4. (10%)

$$G(s) = \frac{K(s+4)}{s(s+2)}$$

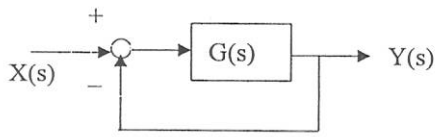

Fig. 2 negative unit feedback control system

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54-2

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(4) (a) Draw the Bode plot of a system with system transfer function.

$$G(s)=\frac{20}{(s+1)(s+10)}$$ (20%)

(b) What is the frequency if $|G(jw)|=1$? (10%)