大葉大學 九十三 學年度 研究所碩士班 招生考試試題紙					
系 所 別	組 別	考 試 科 目 (中 文 名 稱)	考 試 日 期	節 次	備 註
車輛工程研究所	甲	車輛電子學或自動控制	3月28日	第 三 節	●可攜帶計算機 ●試題卷共 3 頁

＊請考生特別注意：請由以下題目中任選五題作答(答題數目不可超過五題，否則不予計分)，每題 20 分。 13:30～15:00

1. Consider the magnetic system shown below. The magnetic force on the mass M is $f(t) = K_i i(t)$,and the back E.M.F of the coil is $e_b(t) = K_b dx/dt$.
   a) Write the equations of motion for this system. (5%)
   b) Sketch the block diagram. (5%)
   c) Find the transfer function $X(s)/E(s)$. (10%)

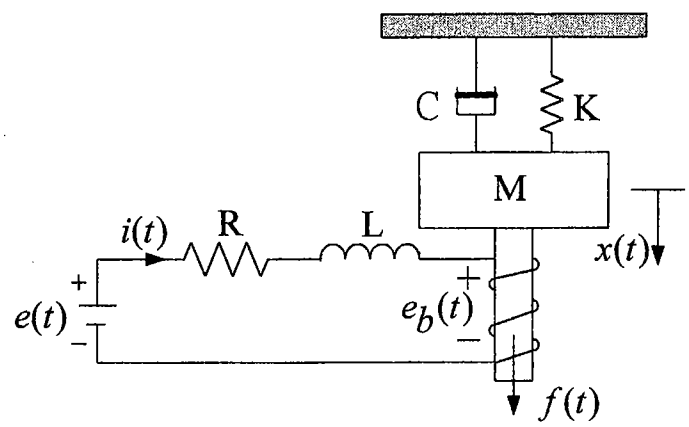

Figure (1)

2. Consider the feedback control system as shown below.
   a) Find K_p , if the steady state error is 0.01 for a unit ramp input. (5%)
   b) For this value of K_p , sketch the root locus of the closed system with $K_d > 0$. (10%)
   c) Find K_d , if the system will have a critical damping ratio (K_p as (b)). (5%)

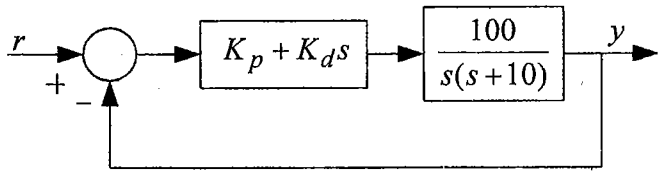

Figure (2)

3. A unity negative feedback control system is characterized by an open loop transfer function

$$G(s) = \frac{K_1 s + K_2}{s^2 + 2s + 10}$$

   a) Find the values of K_1 and K_2 so that the closed loop system has damping rate $\xi = 0.5$ and nature frequency $\omega_n = 10$ rad/sec. (10%)
   b) For those values of K_1 and K_2 , determine the output and the maximum overshoot for a unit step input. (10%)

大葉大學 九十三 學年度 研究所碩士班 招生考試試題紙					
系 所 別	組 別	考 試 科 目 (中 文 名 稱)	考 試 日 期	節 次	備 註
車輛工程研究所	甲	車輛電子學或自動控制	3月28日	第 三 節	●可攜帶計算機 ●試題卷共3頁

＊請考生特別注意：請由以下題目中任選五題作答(答題數目不可超過五題，否則不予計分)，每題 20 分。

13:30~15:00

4. Consider a linear system with the bode plot of magnitude shown below. Assume it is minimum phase.
   a) Estimate the transfer function. (5%)
   b) Sketch the bode plot of phase. (10%)
   c) Is the unity feedback of control system stable ? (5%)

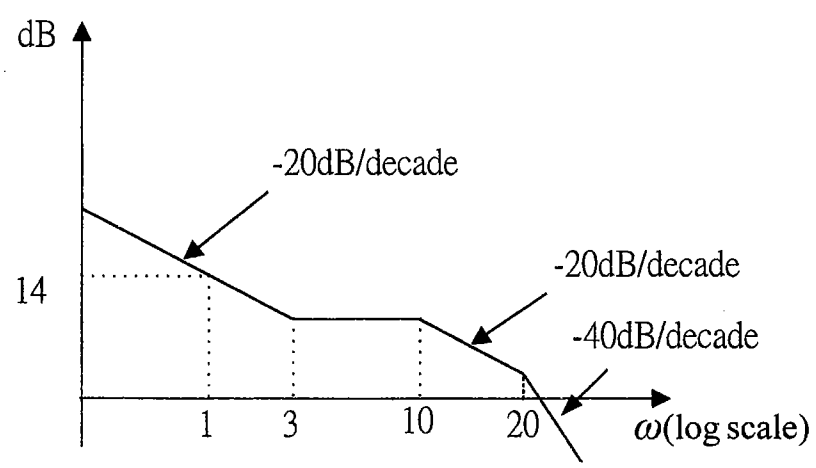

Figure (4)

5. A unity feedback control system has open loop transfer function as

$$\frac{K(s^2+8)}{s^3+4s^2+6s+16}.$$

   a) Determine the range K for stability. (10%)
   b) Determine the value of K which will cause sustained oscillation in the closed loop system and find the corresponding oscillation frequency. (10%)

6. Please derive an expression for the output voltage in the circuit of Figure (5).

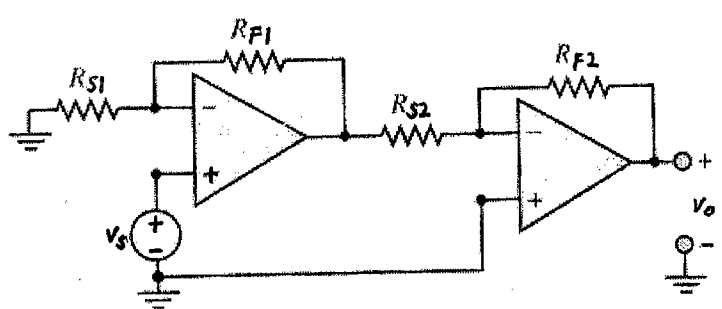

Figure (5)

大葉大學 九十三 學年度 研究所碩士班 招生考試試題紙					
系 所 別	組 別	考 試 科 目 (中文名稱)	考試日期	節 次	備 註
車輛工程研究所	甲	車輛電子學或自動控制	3月28日	第 三 節	•可攜帶計算機 •試題卷共 3 頁

＊請考生特別注意：請由以下題目中任選五題作答(答題數目不可超過五題，否則不予計分)，每題 20 分。

13:30~15:00

7. There are four circuits:❶Schmitt Trigger ❷Bridge Circuit ❸Darlington Pair ❹Voltage Divider. Please answer to questions as follows:
   a)Please describe their function for above each circuit. (10%)
   b)Please write and explain their application in automotive system for above each circuit. (10%)

8. a) Describe two methods of measuring engine speed and tell how each operates. (10%)
   b) Please design and explain a circuit to finish the output signal as follows: (10%)
   input signal: 0.001Sin(60*t*) V
   output signal: 5Sin(60*t*) V.

9. Determine the output voltage of the unbalanced bridge in Figure (6) for a temperature of 65°C. The thermistor has a nominal resistance of 1kΩ at 25°C. Assume that its resistance changes 5Ω for each C° change in temperature.

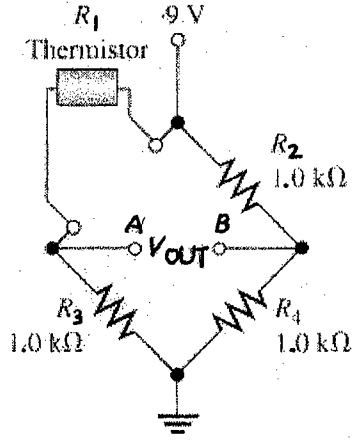

Figure (6)

10. Explain why EMC (Electromagnetic Compatibility) is such an important issue for automotive electronic system designers. Please list and explain one example of EMC problem for automotive system.