114VE03

國立臺北科技大學 114 學年度碩士班招生考試

系所組別：1302 車輛工程系碩士班

第二節　自動控制　試題（選考）

注意事項：

1. 本試題共 4 題，每題 25 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. A suspension system can be modeled as a 2nd order differential equation $\ddot{y}(t) + 12\dot{y}(t) + 32y(t) = 32u(t)$, and all initial conditions are zero.
   (1) Find the solution y(t) by Laplace Transform and inverse Laplace Transform. (15%)
   (2) According to your solution y(t), **approximately** plot the system response y(t)-t diagram for the period t=[0, 2]. (10%)

2. (1). Will the unit-step-input response of a 2nd order system with two poles at -1 and -3 be overdamped system response or underdamped system response? Also **briefly** explain your answer. (5%)
   (2) **Briefly** write down the definitions of (a) rise time, (b) settling time for an underdamped 2nd order system response under unit-step input. (10%)
   (3) **Roughly** copy the Fig. 1 plot into your answer sheet, and mark the rise time and settling time in your plot in answer sheet according to your definitions. (10%)

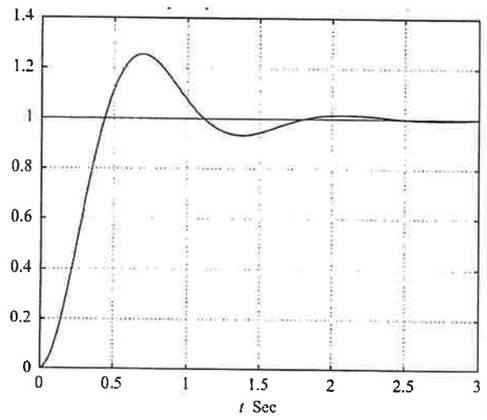

Fig.1

3. Consider an open-loop system with transfer function $\frac{1}{s(s^2+s+1)(s+2)}$. Now a negative unity feedback control with proportional control gain K is applied to this system. Find the range of value of K to ensure system stability under unit-step input. (25%)

4. The block diagram of a system is shown in Fig.2.
   (1) Plot its root locus **approximately**. (10%)
   (2) **Approximately** mark the desired closed -loop poles with damping ratio 0.866 in your root locus (10%)
   (3) Also explain why you choose those pole locations. (5%)

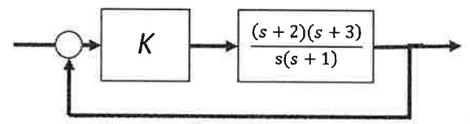

Fig.2