編號： 77

國立成功大學 106 學年度碩士班招生考試試題

系　　所：機械工程學系

考試科目：自動控制

考試日期：0213，節次：1

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Describe the input-output motion behavior of a permanent magnet DC motor by using block diagram. You need to explain the function of each block by employing both mathematical formulation and physical interpretation.
(20%)

2. If a servomechanism can be modeled as a unity feedback system with an open-loop transfer function which is a pure integrator with static gain, analyze the control behavior related to command following, disturbance rejection, sensitivity, and stability robustness.
(30%)

3. Consider the negative feedback closed-loop control system shown in Figure 1, where $G_c(s)$ is the transfer function of the compensator. For $G_c(s)=K$, find the following
   (a) The range of gain to yield stability.
   (b) The value of gain that will yield closed-loop poles that are critically damped.
   (c) The steady-state error with unit-step input.
(25%)

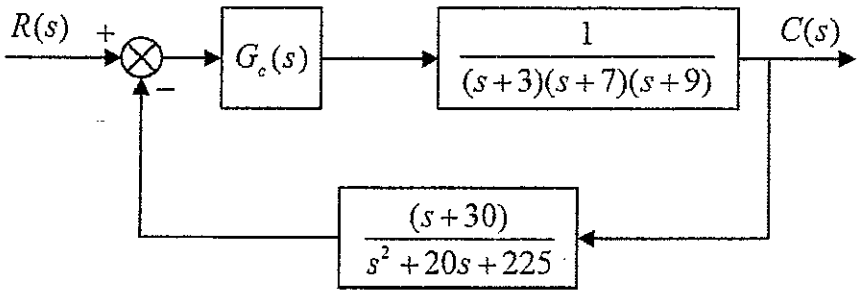

Figure 1. Control system for Problem 3

4. Consider the same system as in Problem 3 and Figure 1. In order to enhance regulation performance, an integrator has been added to the compensator that $G_c(s)=K/s$. Find the following
   (a) The range of gain to yield stability.
   (b) The steady-state error with unit-step input.
   (c) Gain and phase margins by Nyquist Diagram.
(25%)