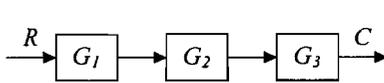國立台灣科技大學九十八學年度碩博士在職專班招生試題
系所組別： 自動化及控制研究所碩士在職專班
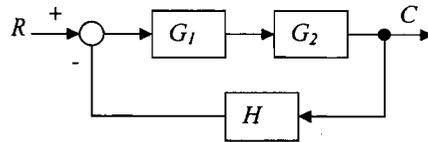科　　目： 自動化及控制實務

（總分為 100 分）

1. Simplify the block diagrams below and find the two equivalent transfer functions C/R (20%)


(a)   (b)

2. In the automatic control system, we need several sensors, actuators, and controller to accomplish the desired function. Please indicate the following elements whether they are generally considered as sensors, actuators, or controller. (a) DC motor, (b) optimal encoder (c) hydraulic cylinder (d) PLC (e) pressure transducer (20%)

3. Explain the following terms: translate and explain their meanings (9%)
   (a) Rise time and maximum overshoot
   (b) Wheatstone bridge
   (c) Silicon controlled rectifier (SCR)

4. Answer true or false to the following statements: (9%)
   (a) A right half plane zero of a transfer function indicates that the system is unstable.
   (b) When using a PID control, increase the proportional gain P generally increases response speed, but may result in oscillatory or unstable responses.
   (c) The brushed DC motor and brushless DC motor both require DC power source to operate.

5. Describe two main reasons (advantage) of using feedback control. (10%)

6. For the following mechanical system, find the transfer function and a state space representation with $f(t)$ as the input and $x(t)$ as the output. Determine if the system is linear or not, and stable or not. (12%)
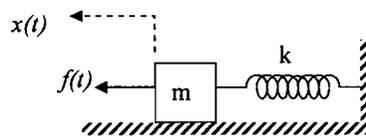
7. The climate control system (恆溫空調) is a new feature in a car to regulate the in-vehicle temperature automatically. In contrast to the conventional air conditioning system, where the users set the desired hot/cold air mixture ratio and fan speed, with the climate control system the users only need to set the desired temperature. From the above two examples, comment on the differences between the feedback control and open-loop control. Emphasize advantage/disadvantage of each system on the cost, functions, and the role of the human users. Describe an example to illustrate the difference in disturbance rejection. (10%)

8. A system is modeled by the transfer function $\dfrac{Y}{R}(s) = \dfrac{6}{s^2+1}$. Find the output y(t) if the input is r(t)=u(t), where u(t) is the unit step function (Heaviside) (10%)

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