

# 淡江大學九十三年學年度碩士班招生考試試題

系別：機械與機電工程學系

科目：動態系統

准帶項目請打「○」否則打「×」
簡單型計算機
○

本試題共 2 頁

1. (20%) A rolling soil compacter consists of a circular cylinder of mass  $m$  and radius  $r$  that is connected to the prime mover by a spring of constant  $k$  as shown in Figure P1. Assuming that the compacter is free to roll on the horizontal surface without slipping, and the mover is stop.
- Find the dynamic equation of the roller?
  - Find the frequency of oscillation of the roller?

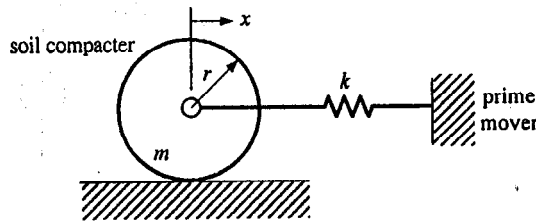


Figure P1

2. (20%) Figure P2 shows a mass  $m1$  coupled to a moving car  $m2$  with viscous friction at the interface between the two. The coefficient of the friction force is  $b$ . The car is free to move on the ground, and is subjected to a force  $F(t)$ . Let the velocity of  $m1$  be denoted as  $v(t)$ , find the transfer function between  $v(t)$  and  $F(t)$ ?

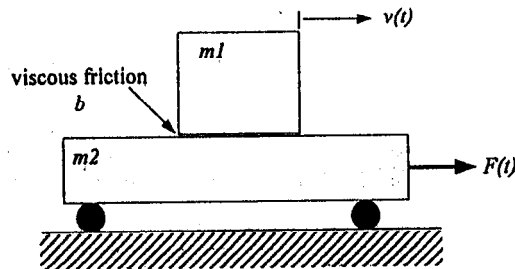


Figure P2

3. (20%) In the circuit shown in Figure P3,
- Find  $V_o(s)/V_i(s)$ ?
  - If  $V_i(t) = 10 + \cos(\omega_o t)$  Volts, where  $\omega_o$  is the frequency. Use the frequency response found in a) to find the steady state  $V_o(t)$ ?

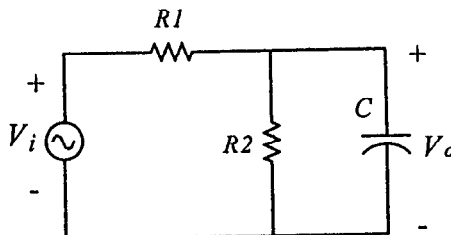


Figure P3

◀ 注意背面尚有試題 ▶

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4. (20%) The circuit shown in Figure P4 has reached steady state before  $t = 0$  sec.  $V1$  and  $V2$  are DC power source. If the switch is closed at  $t = 0$ , find  $V_C(t)$  for  $t \geq 0$ ?

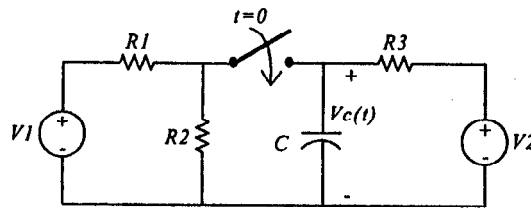


Figure P4

5. (20%) The unit step response of an unknown system is shown in Figure P5. The vertical axis is the output  $y(t)$ , and the horizontal axis is time in seconds. Obtain an estimation of the system's transfer function?

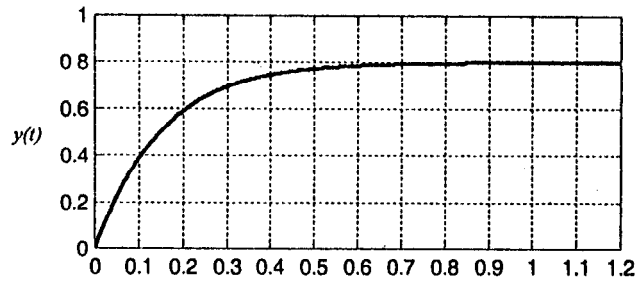


Figure P5