

國立虎尾科技大學 109 學年度第 1 學期博士班資格考試題

系別：動力機械工程系機械與機電工程博士班

第 1 頁 共 2 頁

科目：自動控制

注意事項：

- (1) 本試題共有 5 題，任選 4 題作答，每題 25 分，合計一百分。
- (2) 請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
- (3) 可使用計算機與 close book

1. The following differential equations represent linear time-invariant systems. Write the dynamic equations (state equations and output equations) in vector-matrix form.

$$\frac{d^2 y(t)}{dt^2} + 4 \frac{dy(t)}{dt} + y(t) = 5r(t)$$

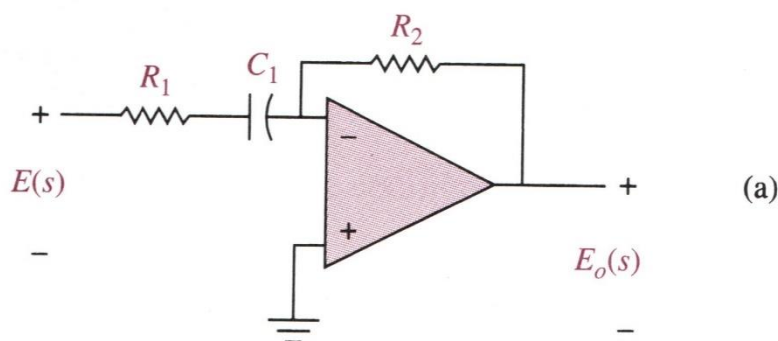
2. The state equations of a linear time-invariant system are represented by

$$\frac{dx(t)}{dt} = \mathbf{A}x(t) + \mathbf{B}u(t)$$

Find the state transition matrix $\phi(t)$, the characteristic equation, and the eigenvalues of A for the following cases.

$$A = \begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

3. Find the transfer functions $E_o(s)/E(s)$ for the circuits shown in Fig.(a)



4. Find the poles and zeros of the following functions (including the ones at infinity, if any). Mark the finite poles with X and the finite zeros with O in the s-plane.

$$F(s) = \frac{5(s+2)}{s(s+1)(s+3)^2}$$

5. Find the Laplace transforms of the following functions. Use the theorems on Laplace transforms if applicable.

$$f(t) = 3 + 5e^{-7t} + 2t^3, \quad (t > 0)$$