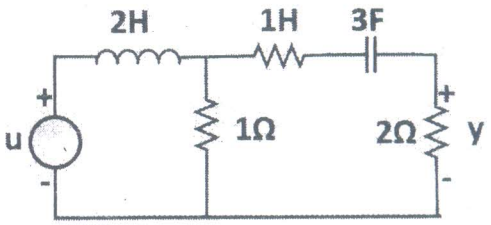
Menoufia University
Faculty of Electronic Engineering
Dept. Industrial electronics and Control Eng.
Final-TERM Exam (3rd Year)

Time : From 10 Am to 1 PM
25/12/2019.
Linear Control System.
(ACE 312)

Pare (II)
Answer the following questions:

Question (1): [12 Degrees]

i) Given the electrical network of Figure, find a state-space representation if the output is the current through the resistor. Select the state variable as: $x_1=i_L$ and $x_2=v_c$.



ii) A system is described by its transfer function

$$\frac{Y(s)}{R(s)} = \frac{2}{(s+2)(s+1)}$$

a) Determine the state space representation.
b) Determine the unit step response of the system when the initial conditions are $x_1(0) = 0$ and $x_2(0) = 1$.

Question (2): [13 Degrees]

i) Consider the nonlinear system model given as:

$$\dot{x}_1 = 3e^{2x_2} + 6\,x_1 + u$$
$$\dot{x}_2 = 4\,sin\,x_1 + 0.5x_2 + 3u$$

a) Find a linearized model at the equilibrium point $x_1 = x_2 = 0$ and
b) Check the system stability of the linearized model.

ii) Consider the system model given as:

$$\dot{X} = \begin{bmatrix} 1 & 0 \\ -4 & -5 \end{bmatrix} X + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$

$$y = [1 \quad 0 \quad 0]X$$

Design a state-feedback controller $u = -kX + r$ such that the closed loop poles are located at -2, -3

Best Wishes
Dr. Ebrahim A. El-hamid