PLEASE NOTE: IF YOU HAVE THE OPINION THAT INSUFFICIENT INFORMATION IS SUPPLIED FOR YOU TO ANSWER A PARTICULAR QUESTION, MAKE A REALISTIC ASSUMPTION, MOTIVATE IT AND THEN ANSWER THE QUESTION.

QUESTION 1

The system shown in Figure 1 has $\%os = 20\%$ and $T_P = 1s$, find the values of *K* and K_A.

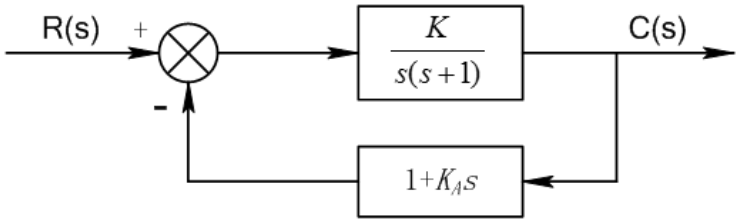

Figure 1: Control System for Question 1

[20]

QUESTION 2

Consider the circuit shown in Figure 2.

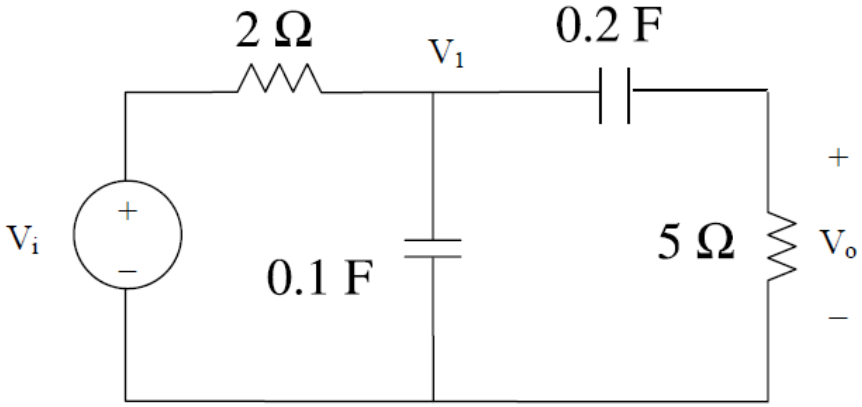

Figure 2: Circuit for Question 2

Determine the transfer function $H(s) = \frac{V_o(s)}{V_i(s)}$ of this system.

[20]

QUESTION 3

A unity negative feedback system has the following forward transfer function.

$$G(s) = \frac{12}{s(s+2)(s+3)}$$

3.1 Evaluate the system type, K_p, K_v and K_a. (8)

3.2 Use your answers to 3.1 to find the steady-state errors for the unit step, 10t and $3t^2$ inputs.

(12)
[20]

QUESTION 4

The closed-loop transfer function of a system is:

$$T(s) = \frac{10}{s^6 + s^5 - 2s^4 - 3s^3 - 7s^2 - 4s - 4}$$

4.1 Construct a Routh-Hurwitz table for the transfer function.

(11)

4.2 Determine how many closed-loop poles lie in the right half-plane, how many closed-loop poles lie in the left half-plane and how many closed-loop poles lie on the jω-axis.

(9)
[20]

QUESTION 5

The Log Magnitude Bode diagram of a minimum phase system is shown in Figure 3. Determine the open loop system transfer function.

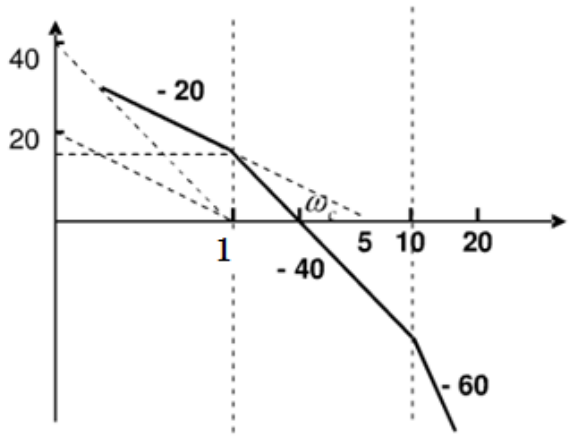

Figure 3: Log-magnitude Bode Plot for Question 5

[20]

TOTAL: 100