



# COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical and Control Engineering

Lecturer : Prof Ezz Eldin Zakzouk

Course : Control Systems I

Course Code: EE 411

Date 31 / 5 / 2015

Time : 2 hours

Marks: 40

## Final Exam

Answer all the following questions

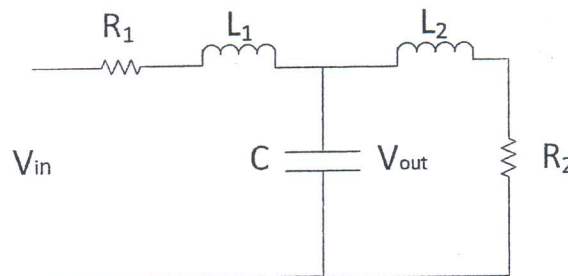
1- For the circuit shown below:

(10 marks)

a. Find the T.F  $\frac{V_{out}(s)}{V_{in}(s)}$

(A-15, B-2, B-5, C-1)

b. Discuss the stability using Routh's criteria.



Where:

$$R_1=R_2=2\Omega, L_1=2H, L_2=1H, C=0.5F$$

2- For the system given by the following forward T.F and  $H(s)=1$  "negative feedback":

(16 marks)

(A-5, B-2, B-5, C-1)

$$G_p(s) = \frac{K(s+1)}{s^2(s+4)}$$

a. Draw the R.L defining:

- The range of K for which the system is stable.
- The value of K for which the damping ratio is 0.5. (8 marks)

b. Draw the Nyquist plot and discuss the stability for all values of K. (4 marks)

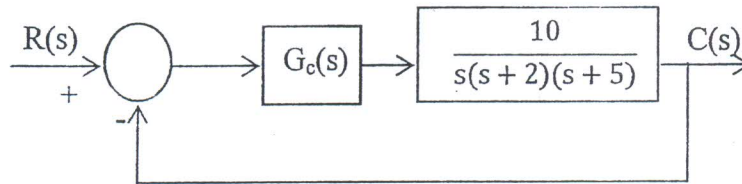
c. Draw the Bode plot for  $K=8$  and find the phase margin and gain margin.

(4 marks)

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3- A control system is given by:

(14 marks) (A-27, B-3, C-1)



- Design a compensator such that the dominant closed loop poles are located at  $s_1 = -2 - j2\sqrt{3}$  and  $s_2 = -2 + j2\sqrt{3}$ , then find  $K_v$  after compensation.  
(7 marks)
- If it is required that the system has  $40^\circ$  phase margin, try the design using Bode plot.  
(7 marks)

**GOOD LUCK**

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