2018

M.Sc.
4th Semester Examination

ELECTRONICS

PAPER—ELC-403

Subject Code—27

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Control Systems and Instrumentations)

Answer Q. No. *1* and any *three* from the rest.

1. (a) Differentiate between open loop control system and closed loop control system.

(b) The open loop transfer function of a unity feedback system is given as

$$G(S) = \frac{50}{(1+0.1S)(S+10)}$$

Determine the static error co-efficient K_p.

(c) Define gain cross-over frequency and phase cross-over frequency.

(Turn Over)

(d) Find the inverse Laplace transform of the following function.

$$F(S) = \frac{1}{S(S+1)}$$

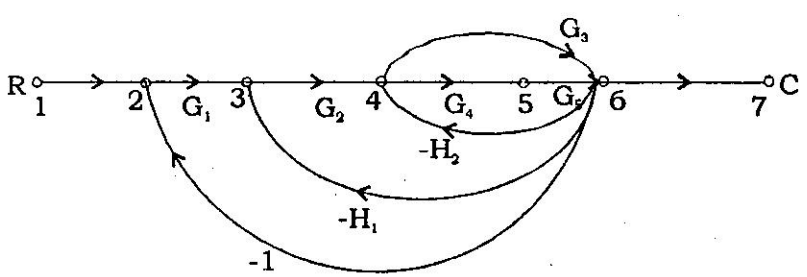
(e) Considering the following set of equations.

$$x_2 = t_{12}x_1 + t_{32}x_3$$
$$x_3 = t_{23}x_2 + t_{43}x_4$$
$$x_4 = t_{24}x_2 + t_{34}x_3 + t_{44}x_4$$
$$x_5 = t_{45}x_4$$

Construct the signal flow graphs for of the system.

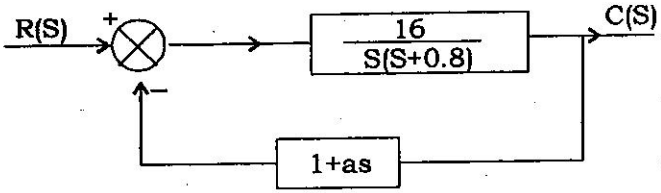
5×2

2. (a) Find C/R of the following signal flow graphs using Mason's gain formula.

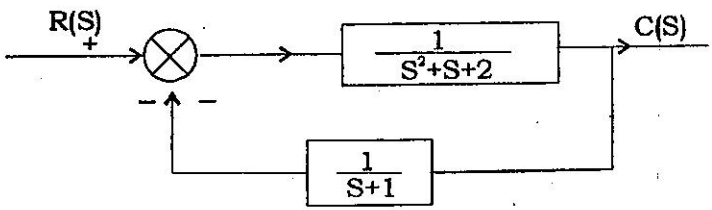


(b) Test the stability of a system whose characteristics equation is $S^3 + 5S^2 + 6s + 30 = 0$ by using Routh-stability criterion. 5+5

3. (a) Consider the system as shown in figure below. Determine the value of 'a' such that the damping ratio is 0.5. Also obtain the values of rise time and maximum overshot M_p in its step response. 2+2+2

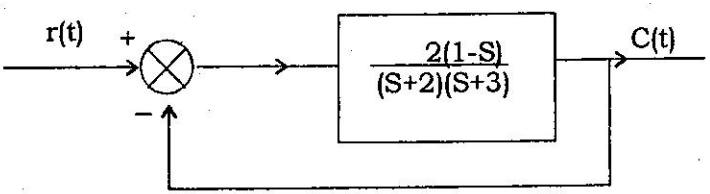


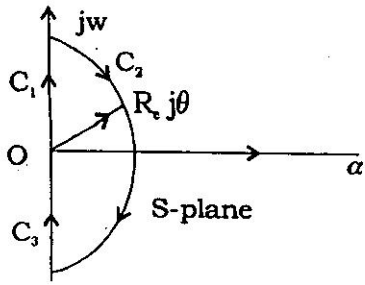
(b)



For the system shown above, determine k_p and e_{ss} for unit step input. 4

4. Fot the system shown in figure below, sketch the Nyquist plot (roughly) for k = 2 and use the Nyquist criterion to determine whether the closed loop system is stable for this gain. Find the range of k for the system to be stable.





6+2+2

5. The open loop transfer function of an unity feedback system is given by $G(S) = \frac{1}{S(1+0.02S)(1+0.04S)}$. Draw the Bode plot. Find the gain margin and phase margin.

6+2+2

6. Define Plezo-resistive effect ? What is Gauge factor ?

A resistance stain gauge with a gauge factor of 2 is cemented to a steel member, which is subjected to a stain of 1×10^{-6}. If the original resistance value of gauge is 130 Ω. Calculate the change in resistance.

Write short notes on semiconductor stain gauge.

2+2+2+4

[Internal Assessment — 10 Marks]