Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST - 1

Even Semester: 2018-19 | **Date**: 06 March 2019

Course Code: EEE 205 | **Time**: 1 Hour

Course Name: Control Systems | **Max Marks**: 40

Programme & Sem: B.Tech (ECE/EEE) & IV Sem | **Weightage**: 20%

Instructions:

(i) *Read the question properly and answer accordingly.*

(ii) *Question paper consists of 3 parts.*

(iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (3Qx4M=12)

1. Distinguish between Linear and Non Linear Control Systems with examples.
2. Write the torque balance equations for (a) ideal inertia (b) ideal spring (c)ideal dashpot
3. What is the effect of feedback on external disturbance in system? Substantiate with necessary equations and diagram

Part B

Answer **both** the Questions. **Each** question carries **eight** marks. (2Qx8M=16)

4. Refer the block diagram shown in the figure 1. The feed forward transfer function $G_f(s)$ is used to eliminate the effect of the disturbance N(s) on the output Y(s). Find the transfer function $\frac{Y(s)}{N(s)}\Big|_{R=0}$. Determine the expression of $G_f(s)$ so that effect of N(s) is entirely removed.

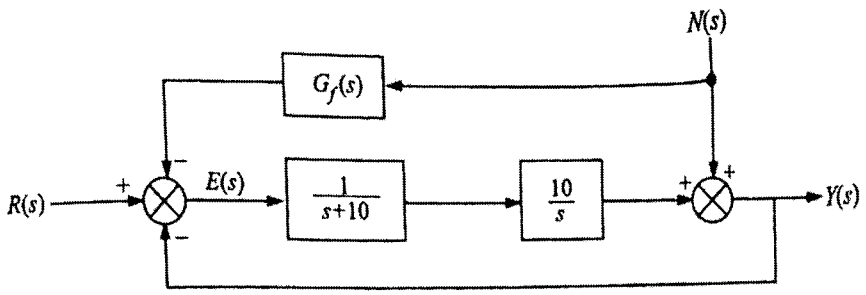


Figure.1

5. Refer the SFG shown in the figure 2. Using Mason's Gain Formula find $\frac{C(s)}{R(s)}$.

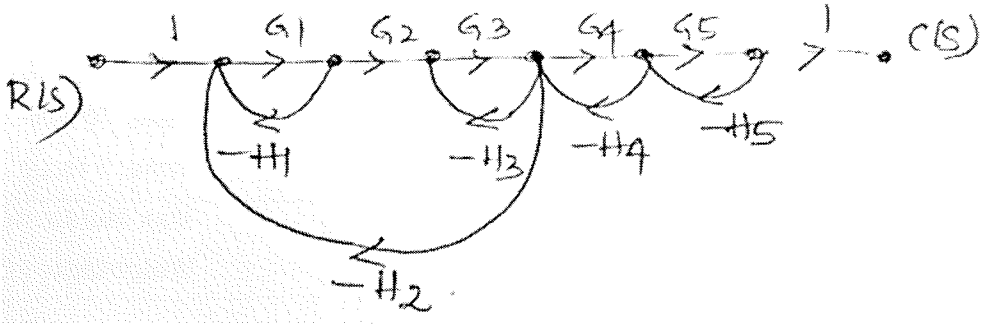


Figure.2

Part C

Answer the Question. Question carries **twelve** marks. (1Qx12M=12)

6. Refer the mechanical system given in the figure 3. (a) Draw the free body diagram (b) Obtain the equations of motion (c) Draw an electrical network based on Force- voltage analogy (d) Draw an electrical network based on Force-Current analogy.

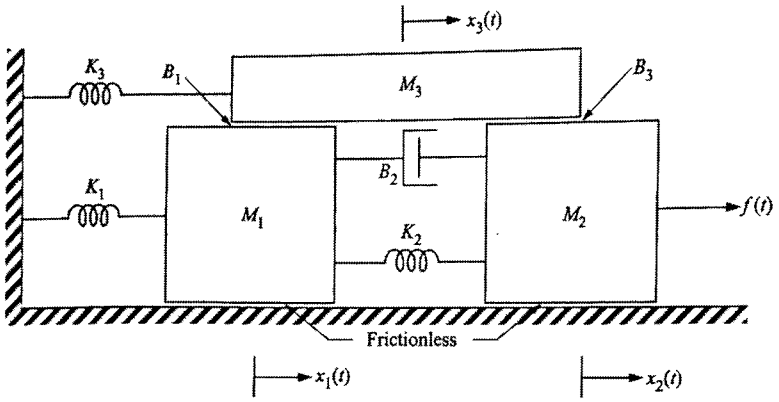


Figure.3

Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST - 2

Even Semester: 2018-19
Course Code: EEE 205
Course Name: Control Systems
Program & Sem: B.Tech & IV Sem (EEE,ECE)

Date: 16 April 2019
Time: 1 Hour
Max Marks: 40
Weightage: 20%

Instructions:

(i) *Read the question properly and answer accordingly.*
(ii) *Question paper consists of 3 parts.*
(iii) Scientific and Non-programmable calculators are permitted

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (3Qx4M=12)

1. How the system is classified depending on the value of damping(ξ)?
2. Find the step response, C (t) for the system described by $\frac{C(S)}{R(s)} = \frac{6}{S+6}$. Also find the time constant, rising time and settling time.
3. How the roots of characteristic equation are related to stability? Illustrate with example.

Part B

Answer **both** the Questions. **Each** question carries **eight** marks. (2Qx8M=16)

4. For a closed loop system having an open loop transfer function G(S)H(S) = $\frac{K(S+2)}{S(S+1)}$ mark all the salient points on Root locus using Root locus technique.
5. A second order control system is represented by a transfer function $\frac{Q(S)}{T(S)} = \frac{1}{JS^2+f\,S+K}$ Where Q is the proportional output and T is the proportional input torque. A step input of 10N-m is applied to the system and the test results are given below

a. Peak overshoot of 6%
b. Peak time = 1 sec
c. The steady state output of the system is 0.5 radian. Determine the values of J, f and K.

Part C

Answer the Question. The Question carries **twelve** marks. (1Qx12M=12)

6. The output of a control system is related to the input by

$$(S^4 + 5S^3 + 3S^2 + (K+3)S + K)C(s) = K(S+2)R(s)$$

Where K represents the positive gain of the amplifier.

a. With K = 8 and a step input, will the output response be stable?

b. Determine the limiting value that K can have for a stable response system.

Roll No												

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Even Semester: 2018-19 | **Date**: 21 May 2019

Course Code: EEE 205 | **Time**: 3 Hours

Course Name: Control System | **Max Marks**: 80

Program & Sem: B.Tech & IV Sem (ECE/EEE) | **Weightage**: 40%

Instructions:

(i) ***Question paper consists of 3 parts.***
(ii) ***Scientific calculators are allowed.***
(iii) ***Answer all the questions.***

Part A

Answer **all** the Questions. **Each** question carries **five** marks. (4Qx5M=20M)

1. Match the following pairs:-

	Set-A	Set-B
(i)	Positive Feedback	(a) N=P-Z
(ii)	Breakaway point	(b) $\frac{C(s)}{R(s)} = \frac{G(s)}{1+G(s)H(s)}$
(iii)	Centroid	(c) $\frac{dk}{ds} = 0$
(iv)	Nyquist stability criteria	(d) $\frac{C(s)}{R(s)} = \frac{G(s)}{1-G(s)H(s)}$
(v)	Negative feedback	(e) $\sigma = \frac{\sum Real(poles) - \sum Real(zeros)}{n-m}$

2. State whether the following statements is TRUE/FALSE:
   (i) Poles are the values of "s" at which system transfer function tends to zero.
   (ii) The critical point for a Nyquist Plot is (-1+j0).
   (iii) State Space Analysis can be used effectively for only SISO systems and not MIMO systems.
   (iv) The feedback on a system may increase or decrease its stability.
   (v) A pole at origin has a slope of +20 dB/decade in a Bode magnitude plot.

3. Choose the correct answer from the given options:

(i) State variable analysis has several advantages overall transfer function as:

a) It is applicable for linear and non-linear and variant and time-invariant system
b) Analysis of MIMO system
c) It takes initial conditions of the system into account
d) All of the mentioned

(ii) For the given transfer function, the type and order of the system is:

$$G(s).H(s) = \frac{8}{s^2 + 3s + 8}$$

a) Type-1, Order-2
b) Type-2, Order-2
c) Type-0, Order-1
d) Type-0, Order-2

(iii) The type of the control system is based on :

a) Open Loop Transfer Function
b) Closed Loop Transfer Function
c) Both
d) None

(iv) The magnitude criteria of Root Locus is given by:

a) $|G(s).H(s)| = 1$
b) Angle ($G(s).H(s)$)= Odd multiples of 180 degree.
c) $|G(s).H(s)| = 0$
d) Angle ($G(s).H(s)$)= Even multiples of 180 degree.

(v) The dB value of a given system transfer function $G(j\omega)H(j\omega)$ is calculated by:

a) dB= $+20\log|G(j\omega)H(j\omega)|$
b) dB= $-20\log|G(j\omega)H(j\omega)|$
c) dB= $-10\log|G(j\omega)H(j\omega)|$
d) dB= $+40\log|G(j\omega)H(j\omega)|$

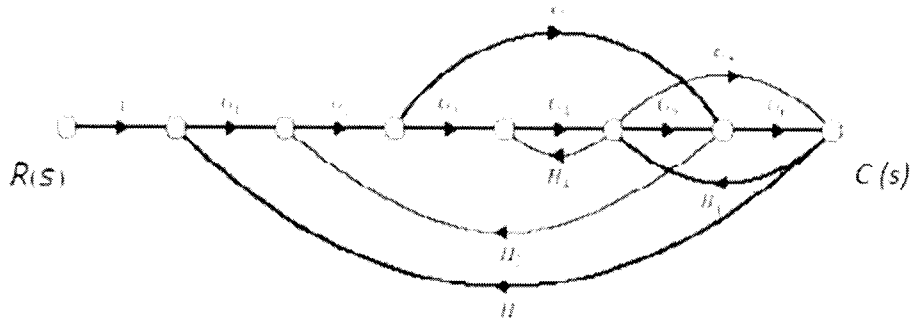
4. Fill in the blanks:

(i) Closed loop control system is _____ accurate than an open loop control system.
(ii) For $\xi = 1$, the system is _____.
(iii) The factor $\frac{1}{j\omega}$ has phase angle equal to_____.
(iv) In Force-Voltage Analogy, current is analogous to _____.
(v) If 'n' and 'm' represents number of open loop poles and zeros respectively, the number of asymptotes is given by_____.

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30M)

5. Evaluate the transfer function $\frac{C(s)}{R(s)}$ using signal flow graph method.



6. Sketch the polar plot for the given transfer function $G(s) = \frac{1}{s(1+sT)}$.
7. A unity feedback control system is characterized by the open loop transfer function

$G(s) = \frac{K(s+13)}{s(s+3)(s+7)}$. Using Routh Stability Criteria:-

   (a) Find the range of values of K for the system to be stable.

   (b) Can the system be marginally stable? If yes, for what value of K and at what frequency will it continue to oscillate?

Part C

Answer **both** the Questions. **Each** question carries **fifteen** marks. (2Qx15M=30M)

8. Draw the Bode plot for the transfer function: $G(s) = \frac{4}{(0.1s+1)^2(0.01s+1)}$. Find the Gain Margin and Phase Margin. Comment upon stability.
9. (i) Describe the necessary equations and explanation of each terms required to represent the state space model of any system. Also define (a) state (b) state variable.

   (ii) Obtain the state equation and output equation of the system from the given differential equations:

   $u(t) = \dddot{c}(t) + 9\ddot{c}(t) + 26\dot{c}(t) + 24c(t)$

   $y(t) = \ddot{c}(t) + 7\dot{c}(t) + 2c(t)$

Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

SUMMER TERM / MAKE UP END TERM EXAMIANTIONS

Semester: Summer Term 2019 | **Date**: 22 July 2019

Course Code: ECE 205 | **Time**: 2 Hours

Course Name: Control System | **Max Marks**: 80

Program & Sem: BTech. & IV Sem (2016 Batch) | **Weightage**: 40%

Instructions: ***Answer all questions in Sections A, B and C***

Part A

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30M)

1. Explain i) Gain Cross over frequency ii) Phase cross over frequency iii) Gain Margin and iv) Phase Margin.
2. Explain phase-Lag compensating network with neat diagrams.
3. Sketch and explain polar plot.

Part B

Answer **both** the Questions. **Each** question carries **ten** marks. (2Qx10M=20M)

4. Explain phase-lead compensating network with neat diagrams.
5. Sketch Bode magnitude plot for the system with TF given as:

$$G(s)H(s) = \frac{1}{s(1+s)(1+2s)}$$

Part C

Answer **both** the Questions. (2Q=30M)

6. Sketch the Bode plot and determine GM and PM for the system with open loop TF as: (20M)

$$G(s)H(s) = \frac{K(s+3)}{s(s+1)(s+2)(s+4)}$$

7. Obtain the state model for an electrical circuit shown in Fig.7 (10M)