

# ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE - 2007 CONTROL SYSTEM

Nime	: 3 Hours l			Full	Marks: 70	1

Graph sheet is printed on Page 31.

	(Multipl	le Choice Type	Questions)	
Cho	ose the correct alternatives	for any ten of t	he following:	$10\times 1=1$
1)	The area under a unit imp	pulse function is		
	a) infinity	<b>b)</b>	zero	
<del></del> 	c) unity	d)	none of these.	
Ħ)	For a feedback control sy	stem of type Z	the steady state errors for a	a ramp inpu
	a) infinite	<b>b</b> )	constant	
	c) zero	<b>d</b> )	indeterminate.	<u> </u>
(H1)	The system represented imaginary axis of S-plane.		er function has some pol	les lying or
	a) unconditionally stab	de b)	conditionally stable	
	c) unstable	( <b>b</b> stage	marginally stable.	
iv)	c) unstable  PID controller improves the		marginally stable.	
iv)		he	marginally stable.  transient response only	
iv)	PID controller improves the	he		
iv) v)	PID controller improves the all steady state response	he se only b)	transient response only	
	PID controller improves the algorithms as steady state response.  c) both (a) and (b)	he se only b) d)	transient response only none of these.	
	PID controller improves the algorithms also steady state response.  c) both (a) and (b)  The root loci are	he se only b) d) en poles and zer	transient response only none of these.	
	PID controller improves that a steady state response c both (a) and (b)  The root loci are  a) straight lines between b continuous curves less than the contin	he se only b) d) en poles and zer between poles &	transient response only none of these.	nfinity

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vi)	The order of the system is determined by	
	a) number of poles in the transfer function	
	b) number of zeros in the transfer function	
	c) difference in number of poles and zeros in the transfer function	
	d) the highest degree of S of the characteristic polynomial.	]
vii)	The initial slope of the Bode plot for a transfer function having a simple zero a origin is	t
	a) - 20 dB/decade 10 dB/decade	
	c) 20 dB/decade - 10 dB/decade.	
viii)	In terms of Bode plot, the system is stable if	
Thy a term of the said	a) both gain margin and phase margin are positive	
	b) both gain margin and phase margin are negative	
eng a series (Secretary)	c) gain margin is positive and phase margin is negative	
A Commence of the second	d) gain margin is negative and phase margin is positive.	]
tx)	The value of $\xi$ for some system is unity. The system response will be	
	a) overdamped b) critically damped	
The second way	c) underdamped d) oscillatory.	]
x)	Transfer function is defined for	
왕이, <i>호라</i> 이다. -	a) non-linear time invariant systems and leaves and the second state of the second sec	
	b) non-linear time variant system	
	c) linear and time invariant system	
n i na postali na post	d) linear and time variant system.	
xd)	The number of root loci for a unity feedback system having open loop transfe	r
	function with finite n number of poles and finite m number of roots is	
	a) $m-n$ b) $n-m$	
	c) m	]
xtiQ	In case of critical damping, the damping ratio is	
	a) less than 0 b) 1	
	c) less than 1 d) greater than 1.	]
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## GROUP - B

# (Short Answer Type Questions)

Answer any three of the following.

 $3 \times 5 = 15$ 

2. The open loop transfer function of a unity negative feedback system is given below :

$$G(s) = \frac{500}{S(S+15)}$$

Find

- a) the transient response for a unit step input
- b) the value of rise time and peak time.

5

3. Determine the stability of system whose characteristic equation is given by

$$s^5 + 2s^4 + 3s^3 + 6s^2 + 5s + 3 = 0.$$

5

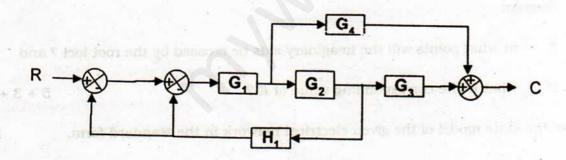
4. a) Define error coefficients corresponding to step and ramp inputs.

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b) A unity feedback closed loop second order system has a transfer function

 $\frac{81}{s^2 + 0.6s + 9}$  and it is excited by a step input of 10 units. Find out its steady state error.

5. Use Block Diagram Reduction technique to find out the overall transfer function of the following sysem:



6. A linear system with single input and output is described by

$$\frac{d^3 c(t)}{dt^3} + \frac{d^2 c(t)}{dt^2} + \frac{4 dc(t)}{dt} + c(t) = 5 u(t).$$

Write the state equations in matrix form.

### GROUP - C

## (Long Answer Type Questions)

Answer any three questions.

 $3 \times 15 = 45$ 

Construct the Bode plots for a unity feedback system whose open loop transfer function is given by  $G(s) = \frac{1}{s(1+s)(1+0.2s)}$ 

From the Bode plot determine

- gain and phase cross-over frequency a)
- gain and phase margin b)
- stability of the closed loop system. c)

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- Using Routh criterion investigate the stability of a unity feedback control system 8. a) whose transfer function is given by  $G(s) = \frac{e^{-sT}}{[s(s+2)]}$ .
  - b) Consider the open loop transfer function of a unity feedback system

$$G(S) = \frac{K(S+3)}{S(S^2+2S+2)(S+5)(S+6)}.$$

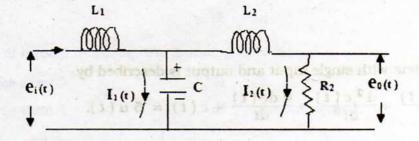
Draw the root locus diagram of the system on a graph paper and indicate on that diagram

- at what points will the imaginary axis be crossed by the root loci? and
- what is the corresponding value of K?

5 + 3 + 1

Obtain the state model of the given electrical network in the standard form. 9.

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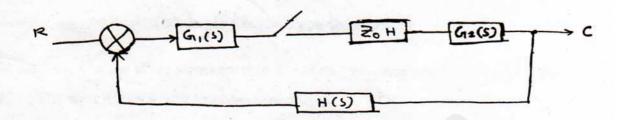
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10. a) Find the Z transform of

$$f(k) = ke^{-3k}$$

$$f(k) = k^2.$$

b) Find  $\frac{C(Z)}{R(Z)}$  for the following sampled data closed system shown in figure below.



11. a) State Nyquist Stability Criterion.

b) Using Nyquist Stability Criterion determine whether the unity feedback close loop system having open loop transfer function,

$$G(s)H(s) = 120/S(S+4)(S+6),$$

is stable or not ?