Hall Ticket No: | | | | | | | | | | | **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
M.E/M.Tech I-Semester Regular Examinations, November 2015

Systems & Control

(Control Systems Engineering)

Date: **Time: 3 hours** **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

1	**a)**	Define sensitivity and list the effects negative feedback on the performance of the system.	(6 M)
	b)	What are the differences between open loop and closed loop systems, explain how closed loop systems are advantageous than open loop systems.	(6 M)
		(or)	
2	**a)**	Explain the term 'impulse' response of the system'.	(6 M)
	b)	Explain about force-current and force-voltage analogous networks.	(6 M)
3	**a)**	Write down the force-current and force-voltage analogous networks for a series RLC network.	(6 M)
	b)	Derive the force-current and force-voltage analogous networks for an armature controlled d. c. servo motor.	(6 M)
		(or)	
4	**a)**	Derive the transfer function of an A.C. Servo motor.	(6 M)
	b)	Derive the transfer function of armature controlled d.c. servo motor.	(6 M)
5	**a)**	Define and derive all the time domain specifications from the step response of a unity feedback system.	(6 M)
	b)	The open loop transfer function of a unity feedback system $G(s) = k/s(s+1)$ The velocity error constant of the system is 25. Design a controller to increase its damping factor to 0.6 without changing its un damped natural frequency and the steady state error for a ramp input.	(6 M)
		(or)	

6	**a)**	Define various test signals and their error constants.	(6 M)
	b)	The open loop transfer function of a unity feedback system G(s)=k/s(1+sT) i)by what factor the gain 'k' should be multiplied, so that the damping ratio can be increased from 0.2 to 0.8 ii) by what factor the gain 'k' should be multiplied, so that the un damped natural frequency can be increased 2 to 4	(6 M)
7	**a)**	Explain Routh-Hurwitz's criterion, based on this criterion how can you define the relative stability of the system.	(6 M)
	b)	Construct the Root locus of open loop transfer function of a unity feedback system G(s)=k/s(s+1)(s+2) i) Find out ' k' value for the damping ratio 0.6 ii)for what value of 'k' system response is continuous oscillations iii)what is the frequency of sustained oscillations.	(6 M)
		(or)	
8	**a)**	Write down all the rules for construction of root locus.	(6 M)
	b)	Show that the root locus of given open loop transfer function of unity feedback system G(s)=k(s+b)/s(s+a) is a circle with a radious $\sqrt{(b^2-ab)}$ and center (-b, 0)	(6 M)
9	**a)**	Explain the correlation between time and frequency responses.	(6 M)
	b)	Draw the Bode plot for the given open loop transfer function of unity feedback system G(s) = 1/s(s+1)(s+2) there from find out the gain margin and phase margin. i) what is the value of 'k' for a phase margin of 20 degrees. ii) what is the value of 'k' for a gain margin of 20 db.	(6 M)
		(or)	
10	**a)**	Explain the significance of phase and gain margins	(6 M)
	b)	Sketch the bode plot for the following open loop transfer function G(s) = ks2/(1+0.2s)(1+.02s) and determine the gain 'k' for the gain cross-over frequency ω_c to be 5 rad/sec	(6 M)