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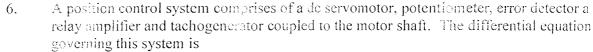
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Code	R13 No: 118AB JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERAB	
	B. Tech IV Year II Semester Examinations, May - 2017 ADVANCED CONTROL SYSTEMS (Electrical and Electronics Engineering) Max. Mai	AG
Note	Part A is compulsory which carries 25 marks. Answer all questions in Part consists of 5 Units. Answer any one full question from each unit. Each question marks and may have a, b, c as sub questions.	A. Part B carries 10
AG .	AGAGAGAGAGAGAG	5 Marks)
1.a) b) c) d) f) g) h) i)	What is meant by compensation? Define the Nyquist stability criterion. States the Lyapunov's instability theorem. What are the conditions for asymptotically stable at the origin? What is meant by singular points? What is stable node. Draw the phase portrait of a stable node? What is the behavior of non linear system? What is meant by sub harmonic oscillations in non linear system? Define the Concepts of state and state variables.	[2] [3] [2] [3] [2] [3] [2] [3] [2] [3]
\bigwedge \bigcirc 2.	The open loop transfer function of unity feedback system is $G(s) = \frac{1}{s(s+1)(s+2)}$,
	the Nyquist plot test the stability. Also find gain margin and phase margin.	[10]
<u>3</u> .	Design a phase lag network for a plant with the open loop transfer $\frac{120}{s(1+0.2s)^2}$ to have a phase margin of 35^0 Verify the performance compensated system with the specification.	function ce of the
4.a) b)	Explain the sufficient conditions of stability of non-linear autonomous system Observe whether the following quadratic form is positive definite $Q = x_1^2 + 2x_2^2 + x_3^2 + 4x_1x_2 - 8x_2x_3 - 2x_1x_3$ The non-linear system described by the following equations $\dot{x}_1 = -2x_1 + 4x_2$	
	$\dot{x}_2 = x_1 - 3x_2 - x_2^3$ Observe the stability of equilibrium state.	[10]
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- \triangle (a) Reaction torque $\ddot{\theta} + 0.5\dot{\theta}$
 - b) Drive torque $\neq 3 sign(e+0.5\dot{e}); e=\dot{\theta}_{B}-\theta$
 - c) Draw the block diagram of the system.
 - d) Construct a phase trajectory on (e, \dot{e}) plane with e(0)=3 and $\dot{e}(0)=1$ and comment upon the system stability.

OR

A simple servo is described by the following equations Reaction torque $= \frac{\partial}{\partial c} + 0.5 \frac{\partial}{\partial c}$ Drive torque $= 2 \ sign(e + 0.5 \frac{\dot{e}}{c})$

 $e = \theta_R - \theta_c$

e(0) = 2 and $\dot{e}(0) = 0$

Construct the phase trajectory using the delta method.

[10]

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Explain the describing function for saturation of non-linearity.

AG:

- 9.a) Discuss the basic concept of describing function methods.
 - b) Derive the necessary expression for describing functions.

 $[5\pm 5]$

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10.

A feedback system has the following closed loop transfer function $\frac{C_{(s)}}{U_{(s)}} = \frac{4(s+1)}{s(s+2)(s+4)}$ Construct three different state models for this system and draw the block diagram

Construct three different state models for this system and draw the block diagram representation for each state model.

OR

- 11.a) States and prove the properties of state transaction matrix
 - b) Determine the state model of the system for the following transfer function

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$$\frac{Y_{(s)}}{U_{(s)}} = \frac{2s^2 + s + 5}{s^3 + 6s^2 + 11s + 4}$$



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[16] A

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