## B.E.(with Credits)-Regular-Semester 2012-Electrical Engineering (E. & P.) Sem VII EP - Control System-II

P. Pages : 2 Time : Three Hours			* 4 6 6 8 *       GUG/W/16/65         Max. Marks	<b>GUG/W/16/6556</b> Max. Marks : 80	
	Note	es: 1. 2. 3. 4. 5.	All questions carry equal marks. Illustrate your answers wherever necessary with the help of neat sketches. Due credit will be given to neatness and adequate dimensions. Assume suitable data wherever necessary. Use of non programmable calculator is permitted.		
1.	a)	Derive th phase lag	te transfer function of lag compensator and the expression for maximum value of	8	
	b)	Draw and	d explain the bode plot of lag lead compensator.	8	
			OR		
2.	a)	Compare i) Spe iii) Rela	and justify the selection of lag and lead compensator fored of responseii)signal to noise ratio at o/pative stabilityiv)Type of system	8	
	b)	Derive th	the transfer function of a passive RC lead network fig. 2(b).	8	
		e <sub>i</sub>	$ \begin{array}{c} \begin{array}{c}  \\  \\  \\  \\  \\  \\  \\  \\  \\  \\  \\  \\  \\ $		
3.	a)	What is s	state transition matrix ? Also describe its properties and computation of same.	8	
	b)	Find state $\dot{x}_1 = -x_1$	e transition matrix of the system given below using infinite series method. + $x_2$ , $\dot{x}_2 = -2 \times 2$	8	
			OR		

b) Comment whether given matrix can reduce to its canonical form If not, obtain Jordan's anonical form.

Derive the expression for the solution of non homogeneous state equations.

 $A = \begin{bmatrix} 4 & 1 & -2 \\ 1 & 0 & 2 \\ 1 & -1 & 3 \end{bmatrix}$ 

4.

a)

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- 5. a) Discuss the effect of pole-zero cancellation in transfer function on controllability and observability.
  - Investigate the controllability and observability of the following fig. 5 (b). b)



## OR

Explain Gilbert's and Kalman test for controllability and observability. 6. a) 8 Examine controllability and observability of the system fig. 6 (b). 8 b)  $X_3$  C(S) R(S) 0.25  $X_1$ 1  $X_2$ 1 24 + 1+0.25s s+1 S  $\overline{8}$ +  $\frac{3}{8}$ Fig 6 (b)

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7.	a)	"Some non-linearities are intentional introduced in the system". Elaborate with example.		
	b)	Explain how describing function can be used in the analysis of non-linear system.	6	
	c)	Enumerate the assumptions used in describing function analysis.		
		OR		
8.	a)	Explain how a stable system may have an unstable limit cycle.	8	
	b)	<ul> <li>Define and explain the following stabilities in reference to phase plane analysis of non-linear system -</li> <li>i) Stable system</li> <li>ii) Asymptotically stable system</li> <li>iii) Globally asymptotically stable system.</li> </ul>	8	
9.	a)	Discuss various methods used for stability analysis of sampled data control system.	8	
	b)	Describe in brief the z-domain and s-domain relationship.	8	
		OR		
10.	a)	Check the stability of the system described by the following characteristic equation using	8	
		Jwey's test $z^4 - 1.7z^3 + 1.04z^2 - 0.268z + 0.024 = 0$	6	
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b) Explain the functioning of sampled data control system with an example. Also give its 8 importance.

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