Total No of Questions: [12]	*SEAT NO. :*	

[Total No. of Pages :3]

T.E. 2008 (Feedback control system)

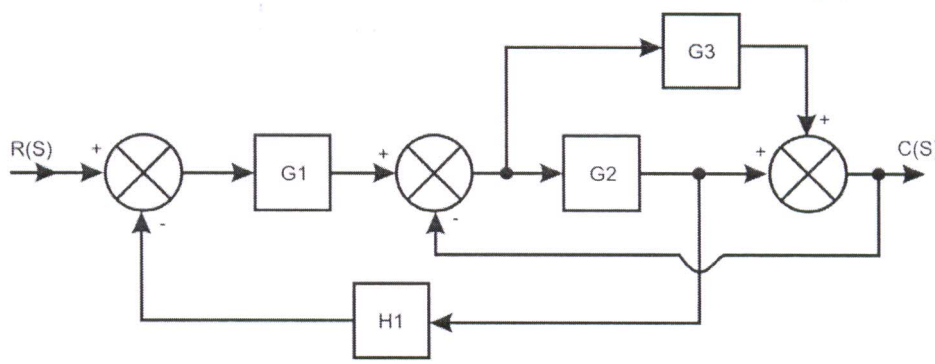
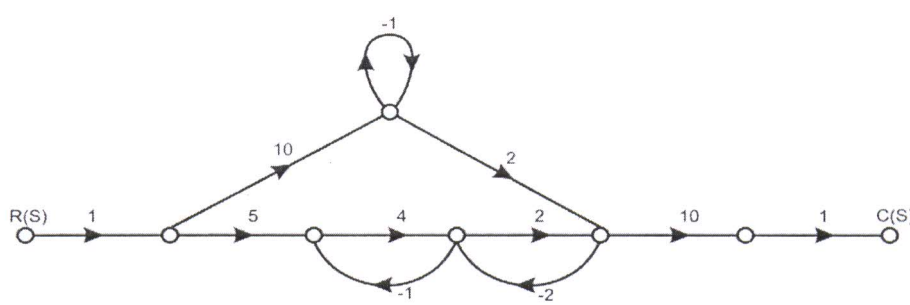
(Semester - I)

Time: 3 Hours *Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Suitable data if necessary***

SECTION I

Q1)	a)	Explain with neat diagram and waveform working principle of synchro error detector	[08]
	b)	Reduce the block diagram to its Canonical form and obtain $\frac{C(s)}{R(s)}$ 	[08]
		OR	
Q2)	a)	Represent the armature controlled DC motor with a block diagram and drive its transfer function.	[8]
	b)	Find $\frac{C(s)}{R(s)}$ by using Mason's gain formula. 	[8]

Q3)	a)	Derive the value of static error constant and steady state error for. i) Type 0 systems. ii) Type 1 system. iii) Type 2 systems.	[8]
	b)	A unity feedback system has $G(s) = \frac{K}{s(s+10)(s^2+4s+5)}$ Determine the range of K for closed loop system to be stable.	[10]
		OR	
Q4)	a)	Sketch the root locus for system with $G(s).H(s) = \frac{K(s+4)}{s(s^2+6s+13)}$	[10]
	b)	A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2+6s+25}$ find it's rise time ,peak time ,peak overshoot and settling time if subjected to unit step input .also calculate expression for its output response.	[6]
Q5)	a)	A Unity feedback control system has $G(s) = \frac{40(s+5)}{s(s+10)(s+2)}$ Draw Bode plot .Determine G_M , P_M ,ω_{gc}, ω_{pc}. Comment on the stabilityof the system	[12]
	b)	State and explain "Mapping theorem".	[6]
		OR	
Q6)	a)	Sketch the Nyquist plot for the system with open loop Transfer function $G(s).H(s) = \frac{k}{s(s+2)(s+10)}$ and hence calculate the range of value of k for stability.	[12]
	b)	Write a short note on correlation between time domain and frequency domain specification.	[6]
		SECTION II	
Q7)	a)	Obtain the state model of a field controlled DC servomotor.	[8]
	b)	Consider the system having state model.	[8]

		$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-2 & -3\\ 4 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}3\\ 5\end{bmatrix}$ u and $y=[\,1\ 1\,]\begin{bmatrix}x_1\\ x_2\end{bmatrix}$ With D=0, obtain its Transfer function.	
Q8)		**OR**	
	a)	Find the state transition Matrix of the State Equation $\begin{bmatrix}x_1\\ x_2\end{bmatrix}=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1\\ 1\end{bmatrix}u$	[8]
	b)	Find the Controllability And Observability of the State Model. $A=\begin{bmatrix}-2 & 1\\ 1 & -2\end{bmatrix}$, $B=\begin{bmatrix}1\\ 0\end{bmatrix}$,$C=[\,1\ -1\,]$	[8]
Q9)	a)	What are thermistors? Explain their construction. Write advantages & limitation of Thermistor.	[8]
	b)	Define the Following 1) Proportional band. 2) Integral gain. 3) Derivative gain. 4) Offset.	[8]
		OR	
Q10)	a)	Draw the PLC Ladder Diagram for "Conveyer system for bottle filling "consider all sensors are direct inputs to PLC.	[8]
	b)	Draw & Explain response of PID controller for 1) Unit step input. 2) Unit ramp input.	[8]
Q11)	a)	Explain how fuzzy logic control scheme can be applied for temperature control of process.	[8]
	b)	Draw a generator block schematic of a fuzzy controller and Explain the function of each block.	[6]
	c)	What do you understand by the term "adaptive fuzzy system".	[4]
		OR	
Q12)	a)	Explain with neat diagram of the biological and Artificial neuron models.	[8]
	b)	Explain the following terms w.r.t Neural network 1) Supervised learning. 2) Unsupervised learning.	[6]
	c)	What are advantages of fuzzy controller over conventional PID controller?	[4]