INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

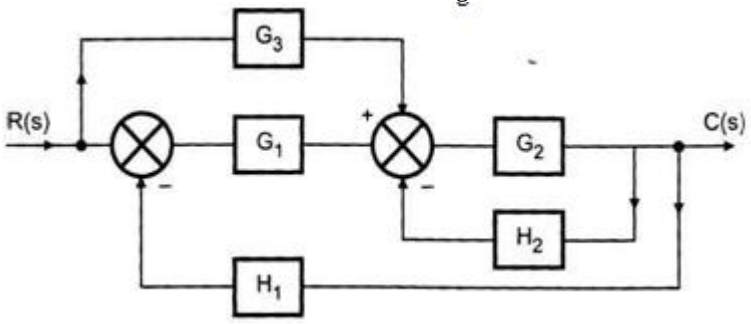
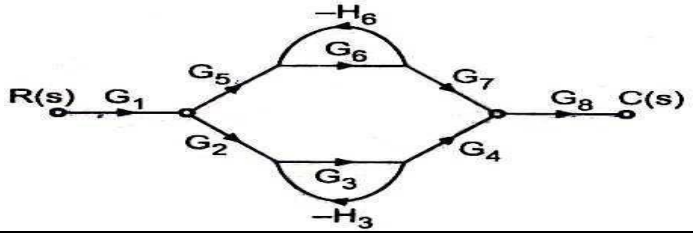
QUESTION BANK

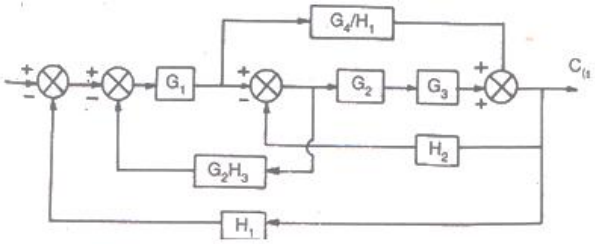
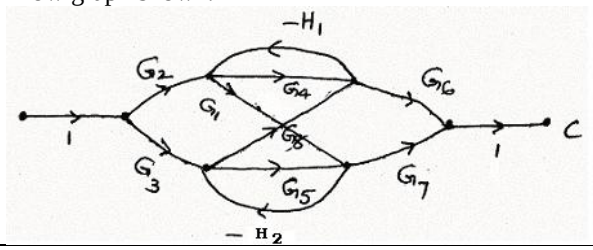
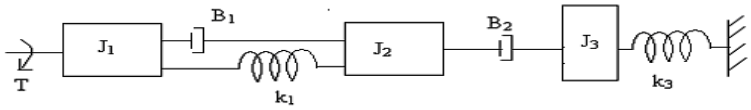
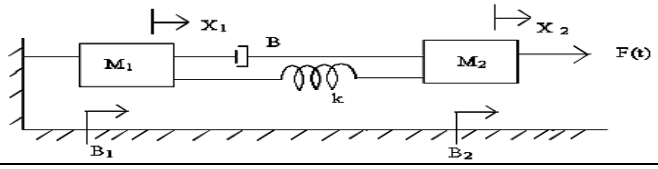
Course Name	:	**CONTROL SYSTEMS**
Course Code	:	**A50217**
Class	:	III B. Tech I Semester
Branch	:	Electronics and Communication Engineering
Year	:	2017 – 2018
Course Faculty	:	Dr. K Nehru, Professor, N Nagaraju, Assistant Professor, ECE Department

OBJECTIVE

This course it is aimed to introduce the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT – I **INTRODUCTION & TRANSFER FUNCTION REPRESSENTATION** **SHORT ANSWER QUESTIONS**		
1	What is control system?	Understand	1
2	Define open loop control system	Understand	1
3	Define closed loop control system.	Understand	1
4	Define transfer function.	Remember	1
5	Write the force balance equations of ideal mass element, dashpot element, spring element	Understand	1
6	Write the analogous electrical elements in force voltage analogy for the elements of mechanical translational system	Understand	1
7	Define signal flow graph?	Understand	1
8	Define transmittance, sink and source?	Understand	1
9	Write Masons Gain formula	Understand	1
10	Discuss forward path?	Understand	1
11	What are the basic elements used for modeling mechanical rotational system?	Remember	1
12	Write the torque balance equation of ideal rotational mass element?	Understand	1
13	Write the torque balance equation of ideal dash-pot element?	Remember	1
14	Define non- touching loop?	Remember	1
15	What is servomechanism?	Understand	1
16	What is Synchro transmitter?	Remember	1
17	What is Synchro receiver?	Remember	1
18	Define forward path?	Understand	1
19	What is the basis for framing the rules of block diagram reduction technique?	Remember	1
20	What are the components of block diagram?	Remember	1
21	Write the rule for moving summing point a head of a block?	Understand	1

S. No	Question	Blooms Taxonomy Level	Course Outcome
22	Define loop?	Remember	1
	LONG ANSWER QUESTIONS		
1	Explain open loop & closed loop control systems by giving suitable Examples & also highlights their merits & demerits.	Understand	1
2	Explain the difference between Open loop and Closed loop systems?	Understand	1
3	Explain the classification of control systems?	Evaluate	1
4	Explain mathematical model of a physical system? Explain briefly	Analyze	1
5	Explain the traffic control systems using open loop and closed loop systems?	Understand	1
6	Discus basis for framing the rules of block diagram reduction technique? What are drawbacks of the block diagram reduction technique?	Understand	1
7	How do you construct a signal flow graph from the equations? List advantages of signal flow graph over block diagram?	Evaluate	1
8	Explain about mason's gain formula?	Analyze	1
9	Explain the temperature control system using open loop and closed loop systems?	Understand	1
10	Human being is an example of closed loop system. Justify your answer?	Understand	1
11	Derive the transfer function of a field controlled D.C. servomotor and develop its block diagram. State the assumptions made if any.	Understand	1
12	Derive the transfer function of an armature controlled D.C. servomotor and develop its block diagram	Understand	1
13	Derive the transfer function of D.C. servomotor and explain about its torque speed characteristics.	Evaluate	1
14	With the help of neat sketches, explain the construction and working principle of synchro transmitter and receiver. Derive the transfer function for synchro?	Analyze	1
15	(a)Explain the differences between AC servomotor and DC servomotor? (b)Explain the practical applications of servomotors?	Evaluate	1
16	Find the transfer function for the block diagram shown as below 	Evaluate	1
17	Describe Synchro as an error detector	Understand	1
18	Obtain the overall transfer function C/R from the signal flow graph shown. 	Evaluate	1
19	What is the basis for framing the rules of block diagram reduction technique?	Remember	1
20	Explain properties of signal flow graphs? Explain the need of signal flow	Remember	1

S. No	Question	Blooms Taxonomy Level	Course Outcome
	graph representation for any system		
21	How do you construct a signal flow graph from the equations?	Understand	1
22	Define transfer function and determine the transfer function of RLC series circuit if the voltage across the capacitor is a output variable and input is voltage source v(s).	Remember	1
23	Derive the transfer function for synchro?	Remember	1
	ANALYTICAL QUESTIONS		
1	Determine the overall transfer function C(S)/R(S) for the system shown in fig 	Evaluate	1
2	Discuss Mason's gain formula. Obtain the overall transfer function C/R from the signal flow graph shown. 	Evaluate	1
3	Write the differential equations governing the Mechanical rotational system shown infig. Draw the Torque-voltage and Torque-current electrical analogous circuits. 	Evaluate	1
4	Write the differential equations governing the Mechanical system shown in fig. and determine the transfer function 	Evaluate	1
5	Obtain the transfer function X1(s)/F(s) for the mechanical system as shown in figure	Evaluate	1

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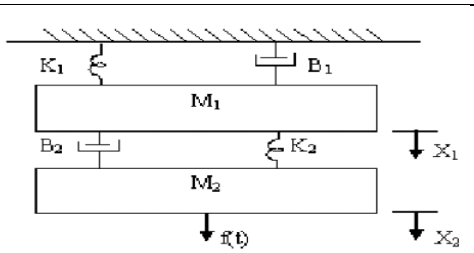
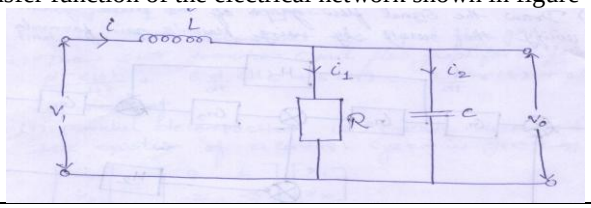
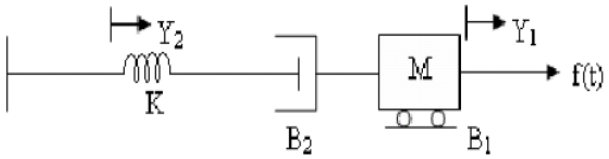
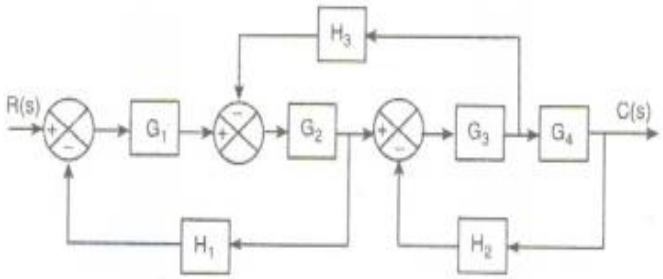
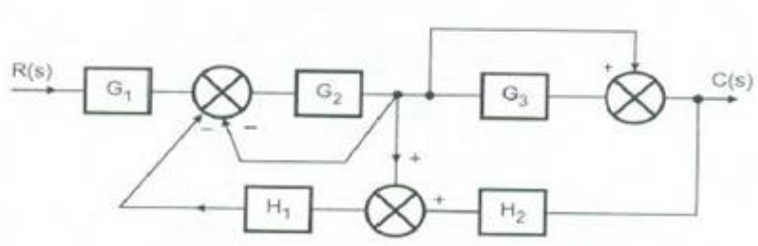
			
6	Find the transfer function of the electrical network shown in figure 	Evaluate	1
7	For the mechanical system shown in Figure 3, determine the transfer function Y1(s)/F(s) and Y2(s)/F(s) 	Evaluate	1
	Determine the transfer function C(S)/R(S) of the system shown below fig by block diagram reduction method 	Evaluate	1
8	Reduce the given block diagram and hence obtain the transfer function C(s)/R(s) 	Evaluate	1
9	Draw a signal flow graph and evaluate the closed-loop transfer function of a system whose block diagram is given as follows	Evaluate	1

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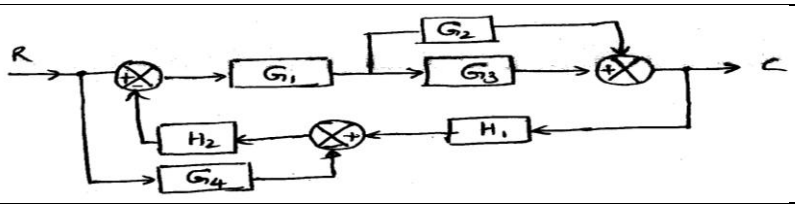
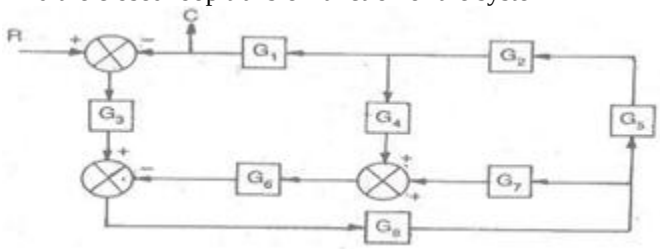
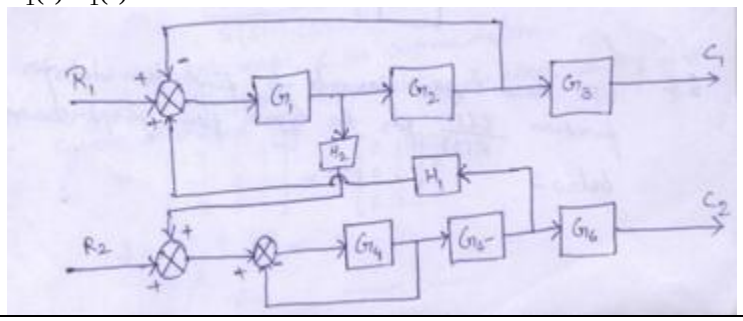
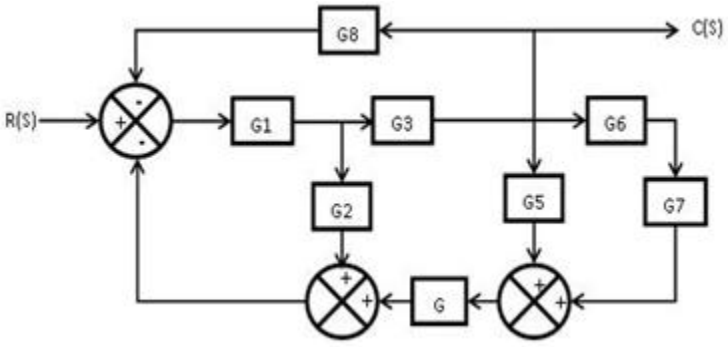
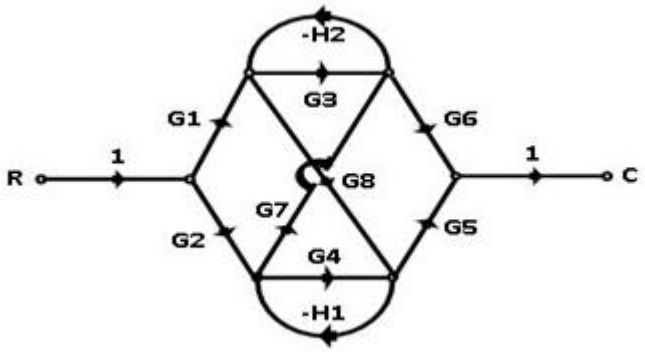
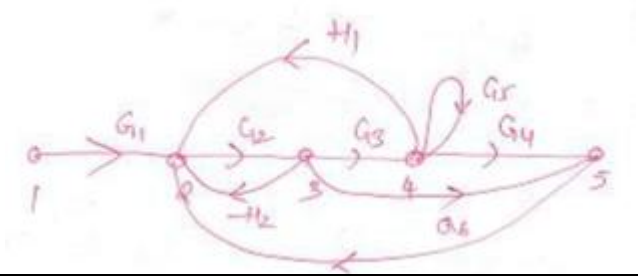
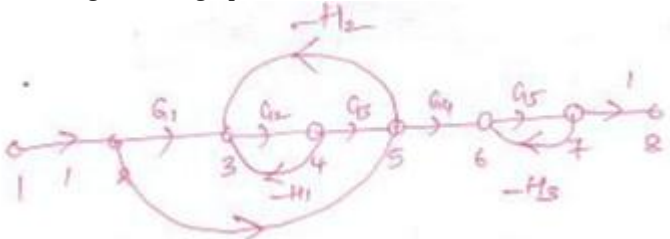
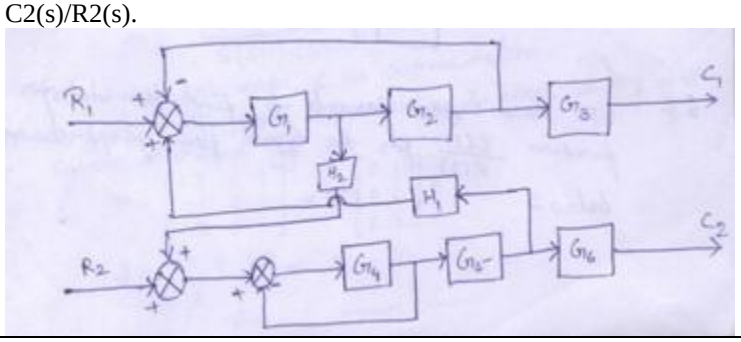
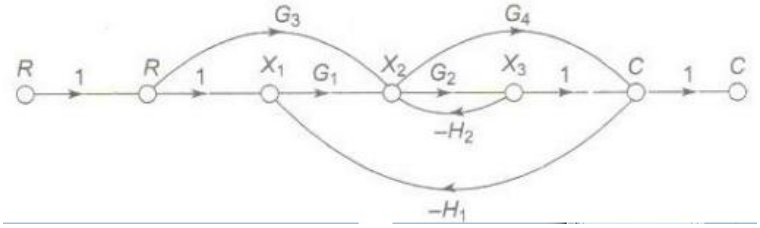
			
10	Find the closed loop transfer function of the system 	Evaluate	1
11	Reduce the given block diagram and hence obtain the transfer function $C_1(s)/R_1(s)$. 	Evaluate	1
12	Find the closed loop transfer function using block diagram reduction technique for the block 	Evaluate	1
13	find the transfer function through the Mason's gain formula for the figure given below	Evaluate	1

S. No	Question	Blooms Taxonomy Level	Course Outcome
			
14	Apply masons gain formula to find its transfer function. 	Evaluate	1
15	For the signal flow graph find transfer function. 	Evaluate	1
16	Reduce the given block diagram and hence obtain the transfer function C2(s)/R2(s). 	Evaluate	1
17	For the signal flow graph shown below fig , find the overall gain 	Evaluate	1

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT - II **TIME RESPONSE ANALYSIS** **SHORT ANSWER QUESTIONS**		
1	What is integral control action? What is the advantage and disadvantage in integral controller?	Remember	2
2	What are the test signals?	Remember	2
3	What is the time response of the first order system?	Remember	2
4	What is the time response of the second order system?	Remember	2
5	Define Damping ratio. How the system is classified depending on the value of damping?	Remember	2
6	Discuss Proportional controller and with advantages?	Remember	2
7	Discuss the drawback in P-controller?	Remember	2
8	Discuss PI, PD, and PID controller?	Remember	2
9	Define Damping ratio. How the system is classified depending on the value of damping?	Remember	2
10	Distinguish between type and order of a system	Remember	2
11	Define rise, Delay time	Remember	2
12	Define Peak time, settling time, Peak overshoot.,	Remember	2
13	Discuss the relation between generalized and static error coefficients	Remember	2
14	List generalized error coefficients?	Remember	2
15	Find the type and order of the system G(S)=40/S(s+4)(s+5)(s+2)	Understand	2
	LONG ANSWER QUESTIONS		
1	(a)Explain about various test signals used in control systems? (b)Define time constant and explain its importance?	Analyze	2
2	(a)How steady state error of a control system is determined? How it can be reduced? (b) Derive the static error constants and list the disadvantages?	Remember	2
3	For a system $G(s)H(s) = \frac{K}{S^2(S+2)(S+3)}$ Find the value of K to limit steady state error to 10 when input to system is $1 + 10t + \frac{40}{2}t^2$	Apply	2
4	(a)Explain error constants K_p, K_v and K_a for type I system. (b) Explain error constants K_p, K_v and K_a for type II system.	Evaluate	2
5	(a)Explain the effect of PI control on the performance of control system (b)Explain the effect of PD control on the performance of control system	Remember	2
6	(a)What are P, D, and controller? Why D controller is not used in control systems? (b) What are generalized error constants? State the advantages and significance of generalized error constants?	Understand	2
7	Discuss the advantages and disadvantages of proportional, proportional derivative, proportional integral control system.	Understand	2
8	(a)Derive the expression for time domain specification of a under damped second order system to a step input?	Evaluate	2
9	(a)Derive the transient response of under damped second order system when excited by unit step input? (b)Derive the transient response of un damped second order system when excited by unit step input?	Evaluate	2
10	(a)Derive the transient response of over damped second order system when excited by unit step input?	Analyze	2

S. No	Question	Blooms Taxonomy Level	Course Outcome
	(b)Derive the transient response of critically damped second order system when excited by unit step input?		
	ANALYTICAL QUESTIONS		
1	A unity feedback system has $G(s) = \frac{40(S+2)}{S(S+1)(S+4)}$ Determine (i) Type of the system (ii) All error coefficients and (iii) Error for the ramp input with magnitude 4	Evaluate	2
2	The closed loop transfer function of a unity feedback control system is given by- $C(s)/R(s) = 20/(s^2+16s+25)$ Determine (i) Damping ratio (ii) Natural undammed resonance frequency (iii) Percentage peak overshoot (iv) Expression for error response	Evaluate	2
3	A unity feedback system is characterized by an open loop transfer function $G(s) = \frac{K}{S(S+10)}$ Determine gain 'K' so that system will have a damping ratio of 0.5. For this value of 'K' determine settling time, peak overshoot and time to peak overshoot for a unit step input. Also obtain closed loop response in time domain	Evaluate	2
4	The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K}{S(TS+1)}$ where K and T are positive constants. By what factor should the amplifier gain be reduced so that the peck overshoot of unit step response of the system is reduced from 75% to 25%?	Evaluate	2
5	A unity feed-back system is characterized by the open-loop transfer function: $G(s) = \frac{1}{s(0.5s+1)(0.2s+1)}$. Determine the steady-state errors for unity-step, unit-ramp and unit-acceleration input. Also find the damping ration and natural frequency of the dominant roots.	Evaluate	2
6	The forward transfer function of a unity feedback type1, second order system has a pole at -2. The nature of gain k is so adjusted that damping ratio is 0.4. The above equation is subjected to input r(t)=1+4t. Find steady state error?	Evaluate	2
7	A feedback control system is described as $G(s) = 50/s(s+2)(s+5)$, $H(s) = 1/s$ For a unit step input, determine the steady state error constants & errors.	Evaluate	2
8	The closed loop transfer function of a unity feedback control system is given by- $C(s)/R(s) = 10/(s^2+4s+5)$ Determine (i) Damping ratio (ii) Natural undammed resonance frequency (iii) Percentage peak overshoot (iv) Expression for error response	Evaluate	2
9	For a unity feedback system whose open loop transfer function is $G(s) = 50/(1+0.1s)(1+2s)$, find the position, velocity & acceleration error Constants.	Evaluate	2
10	The open loop transfer function of a control system with unity feedback is	Evaluate	2

S. No	Question	Blooms Taxonomy Level	Course Outcome
	given by $G(s) = \frac{100}{s(s+0.1s)}$. Determine the steady state error of the system when the input is $10+10t+4t^2$		
	UNIT – III **STABILITY ANALYSIS IN S-DOMAIN** **SHORT ANSWER QUESTIONS**		
1	Define BIBO Stability. What is the necessary condition for stability?	Understand	3
2	What is characteristic equation? How the roots of characteristic equation are related to stability?	Remember	3
3	What is the relation between stability and coefficient of characteristic polynomial?	Understand	3
4	What will be the nature of impulse response when the roots of characteristic equation are lying on imaginary axis?	Remember	3
5	What will be the nature of impulse response if the roots of characteristic equation are lying on right half s-plane?	Remember	3
6	Explain root locus? How will you find root locus on real axis?	Remember	3
7	Discuss asymptotes?	Remember	3
8	Define centroid, how it is calculated?	Remember	3
9	What is breakaway point?	Understand	3
10	Explain dominant pole?	Understand	3
11	What is break in point?	Remember	3
12	Determine poles for G(S)=40/S(s+4)(s+5)	Understand	3
13	Determine poles for G(S)=20/S(s+6)(s+2)	Understand	3
14	Determine the zeros for G(S)=40(s+2)(s+6)/(s+4)(s+5)	Remember	3
	LONG ANSWER QUESTIONS		
1	Define the terms (i) Absolute stability (ii) marginal stability (iii) conditional stability (iv) stable system (v) Critically stable system (vi) conditionally stable system?	Remember	3
2	State Routh's stability criterion. State their advantages What are the limitations of Routh Hurwitz criteria?	Evaluate	3
3	what are the necessary conditions to have all the roots of characteristics equation in the left half of s-plane?	Evaluate	3
4	By means of Routh criterion ,determine the stability represented by characteristic equation ,$s^4+2s^3+8s^2+4s+3=0$	Analyze	3
5	The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K}{S(1+0.25S)(1+0.4S)}$.find the restriction on k so that the closed loop system is absolutely stable.	Evaluate	3
6	With the help of Routh Hurwitz criterion comments upon the stability of the system having the following characteristic equation $S^6+s^5-2s^4-3s^3-7s^2-4s-4=0$	Create	3
7	Check the stability of the given characteristic equation using Routh's method $S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$		

S. No	Question	Blooms Taxonomy Level	Course Outcome
8	(a)Explain the steps for the construction of root locus? (b)From the given root locus plot, how can you determine the gain margin and phase margin for the specified gain value 'k'	Evaluate	3
9	The open loop transfer function of a control system is given by G(s) H(s) = $\frac{K}{S(S+6)(S^2+4S+13)}$ sketch complete root locus	Evaluate	3
10	Check whether the points lie (-1+j) and (-3+j) lie on the root locus of a system given by G(s) H(s)= $\frac{1}{(S+1)(S+2)}$.use the angle condition.	Analyze	3
11	Sketch the root locus G(S)=K/s(s^2+6s+10), H(S)=1	Evaluate	3
12	Locate the zeros and poles of the TF in the s-plane G(s)=13(s+7)(s+9)/(s^2+5s+8)	Evaluate	3
13	Using the routh's criterion determine the stability of the system represented by characteristic equation $s^4+8s^3+18s^2+16s+5=0$	Evaluate	3
14	Using the routh's criterion determine the stability of the system represented by characteristic equation $s^7+9s^6+24s^5+24s^3+24s^2+23s+15$	Analyze	3
15	Construct the routh array for the unity feedback system G(s)=10/s(s+2)(s+4)(s+6)	Evaluate	3
	ANALYTICAL QUESTIONS		
1	A unity feedback system has an open loop transfer function $G(s)=\frac{K}{(s+2)(s^2+4s+5)}$. Use RH test to determine the range of positive values of K for which the system is stable	Evaluate	3
2	Find the range of K for stability of the system with characteristic equation $s^4+3s^3+3s^2+2s+k=0$	Evaluate	3
3	For the unity feedback system the open loop T.F. is $G(s)=\frac{K}{S(1+0.6S)(1+0.4S)}$ Determine(a) Range of values of K, marginal K (c) Frequency of sustained oscillations	Evaluate	3
4	How many roots does each of the following polynomials have in the right half of the s-plane. $s^4+2s^3+4s^2+8s+15$	Evaluate	3
5	The system having characteristic equation2 $s^4+4s^2+1=0$ (i) the number of roots in the left half of s-plane (ii) the number of roots in the right half of s-plane (iii)The number of roots on imaginary axis use RH stability criterion.	Evaluate	3
6	Find the range of K for stability of the system with characteristic equation $s^4+3s^3+3s^2+2s+k=0$	Evaluate	3
7	For the unity feedback system the open loop T.F. is $G(s)=\frac{K}{S(1+0.6S)(1+0.4S)}$ Determine(a) Range of values of K, marginal K (c) Frequency of sustained oscillations	Evaluate	3
8	Sketch the Root Locus for the unity feedback system with $G(s)H(s)=\frac{K}{S(S+1)(S+3)(S+6)}$ Find the breakaway point on real axis and find K of damping ratio=0.5	Evaluate	3
9	Sketch root locus plot for unity feedback system whose open loop T.F is given by G(S)=$\frac{k(s+0.5)}{s^2(s+4.5)}$	Evaluate	3

S. No	Question	Blooms Taxonomy Level	Course Outcome
10	Sketch the root locus plot of a unity feedback system whose open loop T.F is G(s)=$\frac{s}{(s^2+4)(s+2)}$	Evaluate	3
	UNIT-IV **FREQUENCY RESPONSE ANALYSIS** **SHORT ANSWER QUESTIONS**		
1	What is frequency response? What are advantages of frequency response analysis?	Understand	4
2	What are frequency domain specifications?	Understand	4
3	Define Resonant Peak.	Understand	4
4	What is Bode plot? What are the advantages of Bode Plot?	Understand	4
5	Define gain margin	Understand	4
6	Define corner frequency.	Understand	4
7	Explain Gain cross-over frequency and phase cross-over frequency?	Understand	4
8	What is polar plot?	Understand	4
9	What is lead compensator?	Understand	4
10	What is lag compensator??	Understand	4
11	What is lead lag controller techniques.	Understand	4
	LONG ANSWER QUESTIONS		
7	What is frequency response? What are advantages of frequency response analysis?	Understand	5
8	(a)write short notes on various frequency domain specifications (b) Derive expression for resonant peak and resonant frequency and hence establish correlation between time and frequency response.	Evaluate	5
9	Explain the steps for the construction of Bode plot? What are the advantages of Bode Plot?	Evaluate	5
10	Explain with the examples (i) minimum phase function (ii) non-minimum phase function (iii) all pass function	Analyze	5
11	Sketch the Bode plot for the open loop transfer function $G(s) = \frac{10(S+3)}{S(S+2)(S^2+4S+100)}$	Evaluate	5
12	The open loop transfer function of a system is $G(s) = \frac{K}{S(1+S)(1+0.1S)}$ Determine the value of K such that (i) Gain Margin = 10dB and (ii) Phase Margin = 50 degree	Analyze	3
13	Given the open loop transfer function $\frac{20}{s(1+3s)(1+4S)}$Draw the Bode plot and hence the phase and gain margins.	Analyze	3
14	Sketch the bode plot for a system with unity feedback having the transfer function, and assess its closed-loop stability. $G(s) = \frac{75}{S(s^2+16s+100)}$	Analyze	3
15	Sketch the bode plot for a system with unity feedback having the transfer function, and assess its closed-loop stability. $G(s) = \frac{10}{S(1+0.4s)(1+0.1s)}$	Analyze	3
16	Draw the polar plot for open loop transfer function for unity feedback system	Analyze	3

S. No	Question	Blooms Taxonomy Level	Course Outcome
	G(s)= $\frac{1}{s(1+s)(1+2S)}$.determine gain margin, phase margin?		
	LONG ANSWER QUESTIONS		
1	Given damping ratioξ=0.7 and ω_n=10 rad/sec find the resonant peak, resonant frequency and band width.	Evaluate	4
2	For a second order system with unity feedback G(s) =$\frac{200}{s(s+8)}$.find various frequency domain specifications.	Evaluate	4
3	Sketch bode phase angle plot of a system G(s)=$\frac{1}{(1+s)(1+2s)}$	Evaluate	4
4	Draw the exact bode plots and find the gain margin and phase margin of a system represented by G(s)H(s)= $\frac{10(s+1)}{s\,(s+0.05)(s+3)(s+5)}$	Evaluate	4
5	Draw the exact polar plots G(s)= $\frac{10(s+1)}{s\,(s+0.05)(s+3)(s+5)}$,H(S)=1	Evaluate	4
6	The open loop transfer function of a unity feedback system is G(s)= $\frac{50K}{s\,(s+10)(s+5)(s+1)}$ (i)gain margin and phase margin (ii) the value o steady state error coefficient for a gain of 10db and the value which will make the closed loop system marginally stable.	Evaluate	4
7	Sketch the bode plot for transfer function G(s)= $\frac{Ks^2}{(1+0.2s)(1+0.02s)}$and find value of K such that gain cross over frequency is 5 rad/sec	Evaluate	4
8	Sketch the bode plot or a system G(s) = $\frac{15(s+5)}{s\,(s^2+16s+100)}$.hence determine the stability of the system.	Evaluate	4
9	Sketch the bode plots of G(s)= $\frac{e^{-0.1s}28.5}{s(1+s)(1+0.1s)}$.hence find the gain cross over frequency	Evaluate	4
10	A unity feedback control system has G(s)= $\frac{K}{s(s+1)(1+\frac{s}{10})}$.find the value of K so that GM=12db and PM=30deg.	Evaluate	4
11	Sketch polar plot for G(S) = $\frac{1}{S^2(1+s)(1+2s)}$ with unity feedback system. Determine gain margin and phase margin.	Evaluate	4
	UNIT-V **STATE SPACE ANALYSIS OF CONTINUOUS SYSTEM** **SHORT ANSWER QUESTIONS**		
1	Define observability?	Remember	5
2	Define controllability?	Understand	5
3	What are Eigen values?	Understand	5
4	What are draw backs of transfer function model analysis	Remember	5
5	What is state, state variable and state vector?	Remember	5
6	What are the properties of state transition matrix?	Understand	5
7	Write properties of state transition matrix?	Understand	5
8	What are the advantages of state space analysis?	Understand	5

S. No	Question	Blooms Taxonomy Level	Course Outcome
9	Write resolving matrix?	Remember	5
10	How the modal matrix can be determined?	Understand	5
11	What is i/p and o/p space?	Remember	5
12	What are eigen values?	Understand	5
	LONG ANSWER QUESTIONS		
1	Explain the state variable and state transition matrix?	Remember	5
2	Write shot notes on formulation of state equations?	Analyze	5
3	Derive the expression for the calculation of the transfer function from the state variables for the analysis of system?	Apply	5
4	Write short notes on canonical form of representation .list its advantages and disadvantages?	Evaluate	5
5	derive the controllable canonical form for the following transfer function $\frac{Y(S)}{U(S)}=\frac{b_0S^n+b_1S^{n-1}+b_2S^{n-2}+\cdots\ldots\ldots b_nS+b_n}{S^n+a_1S^{n-1}+a_2S^{n-2}\ldots\ldots\ldots(S+P_n)}$	Evaluate	5
6	derive the observable canonical form for the following transfer function $\frac{Y(S)}{U(S)}=\frac{b_0S^n+b_1S^{n-1}+b_2S^{n-2}+\cdots\ldots\ldots b_nS+b_n}{S^n+a_1S^{n-1}+a_2S^{n-2}\ldots\ldots\ldots(S+P_n)}$	Evaluate	5
7	Write properties of state transition matrix?	Remember	5
8	State and explain controllability and observability?	Analyze	5
9	Write the necessary and sufficient conditions for complete state controllability and observability?	Remember	5
10	obtain the Jordan canonical form of state space representation for the following transfer function $\frac{Y(S)}{U(S)}=\frac{b_0S^n+b_1S^{n-1}+b_2S^{n-2}+\cdots\ldots\ldots b_nS+b_n}{(S+P_1)^n(S+P_4)(S+P_5)\ldots\ldots\ldots(S+P_n)}$	Evaluate	5
	ANALYTICAL QUESTIONS		
1	convert the following system matrix to canonical form and hence calculate the STM A=$\begin{bmatrix}4&1&-2\\1&0&2\\1&-1&3\end{bmatrix}$	Analyze	5
2	a system variables for the state variable representation of the system are, A=$\begin{bmatrix}-1&1\\1&-2\end{bmatrix}$,B=$\begin{bmatrix}0\\1\end{bmatrix}$, $C=[1\quad 0]$ Determine the complete state response and the output response of the system for the initial state X(0)=$\begin{bmatrix}-1\\0\end{bmatrix}$	Apply	5
3	for the state equation $\dot{x}$=Ax Where A=$\begin{bmatrix}0&1&0\\3&0&2\\-12&-7&-6\end{bmatrix}$.find the intial condition vector x(0) which will excite only the mode corresponding to eigen value with the most negative real part.	Evaluate	5
4	consider the differential equation system given by $y+3\ddot{y}+2\dot{Y}=0$, y(0)=0.1,y(0)=0.05.	Apply	5

S. No	Question	Blooms Taxonomy Level	Course Outcome
	Obtain the response y(t),subjected to the given intial condition		
5	consider the system described by the state equation $X(t)=\begin{bmatrix}1 & e^{-t}\\ 0 & -1\end{bmatrix}x(t)+\begin{bmatrix}0\\ 1\end{bmatrix}u(t)$	Analyze	5
6	determine the state controllability and observability of the following system $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-3 & -1\\ -2 & 1.5\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1\\ 4\end{bmatrix}u$ C=[0 1]	Evaluate	5
7	examine the observability of the system given below using canonical form $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 1 & 1\\ 0 & -2 & -3\end{bmatrix}\begin{bmatrix}x1\\ x2\\ x3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u$ $Y=[3\ 4\ 1]\begin{bmatrix}x1\\ x2\\ x3\end{bmatrix}$	Analyze	5
8	linear time invariant system is described by the following state model. Obtain the canonical form of the state model. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-1 & 1\\ 1 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u$ and $y=[1/3 \quad -1/3]$	Analyze	5
9	convert the following system matrix to canonical form $A=\begin{bmatrix}1 & 2 & 1\\ -1 & 0 & 2\\ 1 & 3 & -1\end{bmatrix}$	Evaluate	5
10	a linear time invariant system is described by the following state model.obtain the canonical form of state model $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-1 & 0\\ 0 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1\\ 1\end{bmatrix}u$ and $y=[-1 \quad -2]\begin{bmatrix}x_1\\ x_2\end{bmatrix}$	Evaluate	5

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