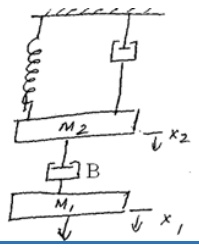
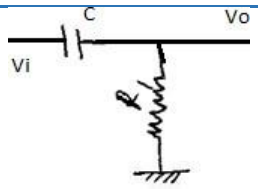
QUESTION BANK

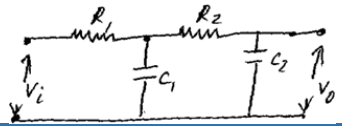
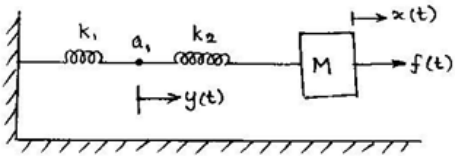
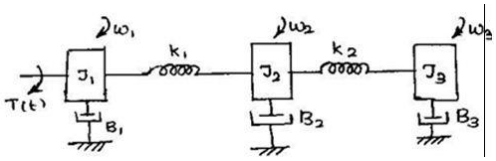
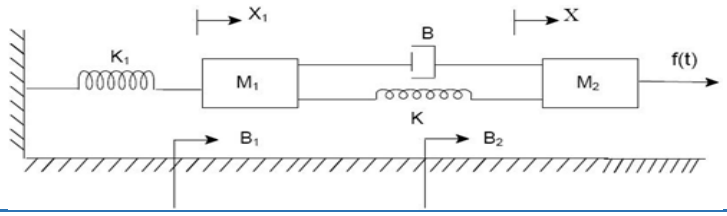
SUBJECT CODE&NAME: AE8505- CONTROL ENGINEERING

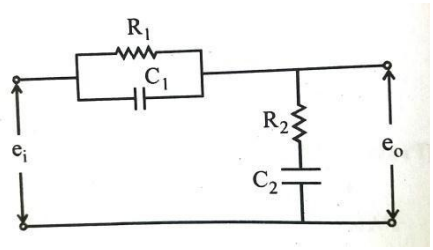
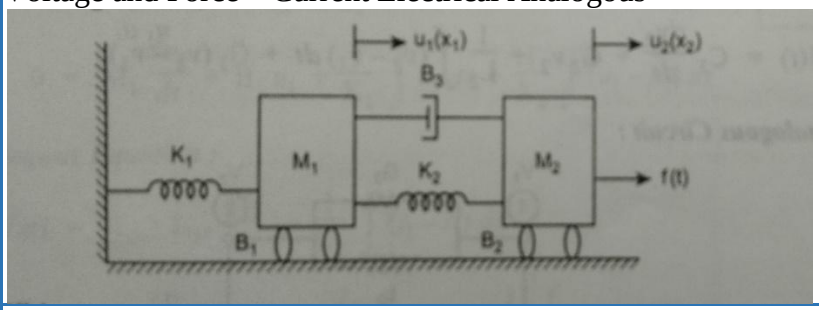
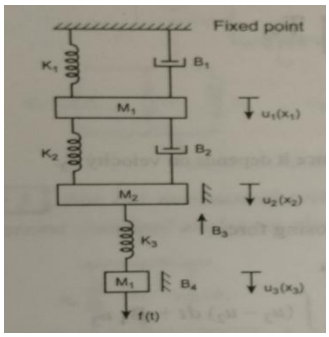
YEAR/SEM : III/V

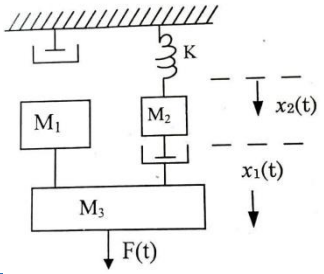
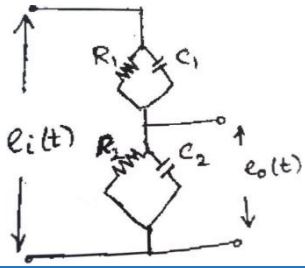
UNIT – I – INTRODUCTION			
PART- A			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Design the Electrical analogous network for the mechanical system shown in the fig. using Force-Voltage Analogy. 	BTL 6	Creating
2.	Mention the transfer Function of the System.	BTL 1	Remembering
3.	Give the mathematical expression representing the system dynamics of a hydraulic system.	BTL 1	Remembering
4.	Draw the block diagram of a flight control system.	BTL 1	Remembering
5.	Give the mathematical expression representing the pneumatic system.	BTL 2	Understanding
6.	Explain any two dynamic models to represent control system.	BTL5	Evaluating
7.	Give the mathematical expression representing the thermal system.	BTL 2	Understanding
8.	Demonstrate the basic elements used for modeling a mechanical rotational system.	BTL 3	Applying
9.	What are the basic components in a electrical system?	BTL 1	Remembering
10.	Write F-V Analogy for the elements of mechanical rotational system?	BTL 1	Remembering
11.	Define Control System	BTL 1	Remembering
12.	Name the two types of electrical analogous for mechanical system.	BTL 1	Remembering
13.	Formulate force balance equation of ideal spring, ideal mass.	BTL 6	Creating
14.	Calculate transfer function of the network	BTL3	Applying

			
15.	Describe mathematical model of a system.	BTL 2	Understanding

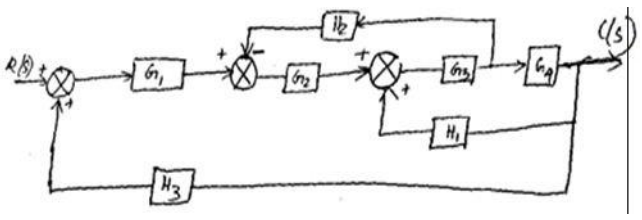
PART- B

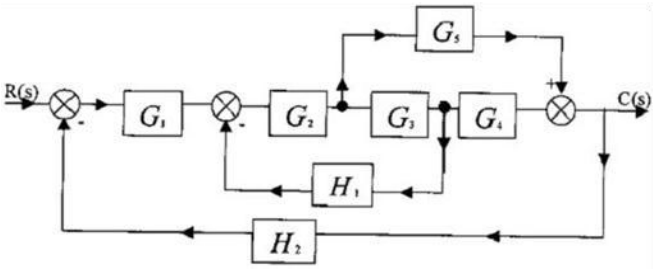
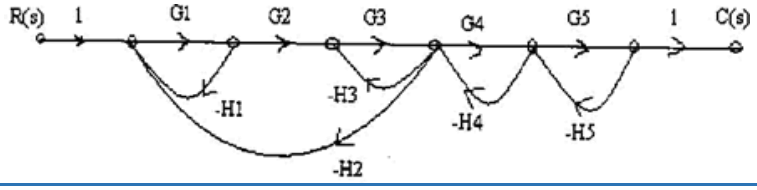
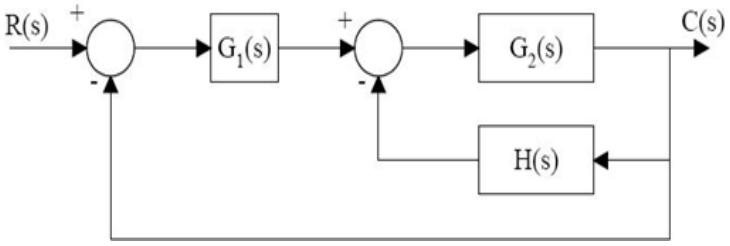
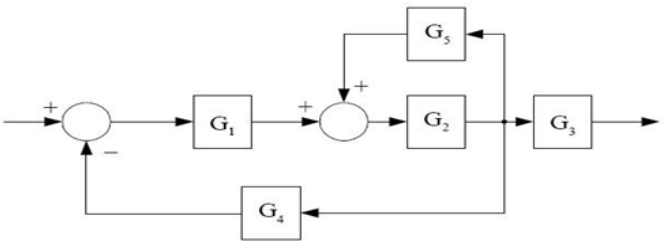
S.NO	QUESTIONS	BT BTL	COMPETENCE
1.	Estimate the Transfer function of the electrical network shown in the fig. (6) 	BTL 5	Evaluating
2.	(i) Consider the Mechanical system shown below and write the Differential equation. (7)  (ii) Draw the torque-voltage electrical analogous circuit for the mechanical system shown below. (6) 	BTL1	Remembering
3.	Demonstrate the differential Equations governing the mechanical system shown in the fig. and determine the transfer function. (13) 	BTL2	Understanding

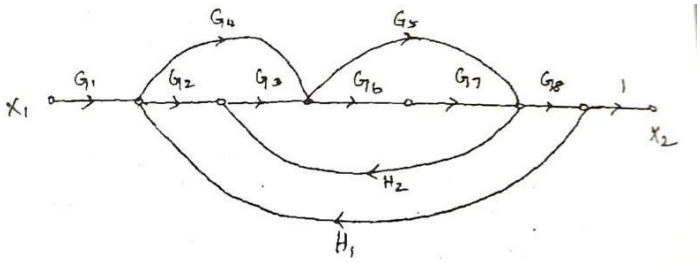
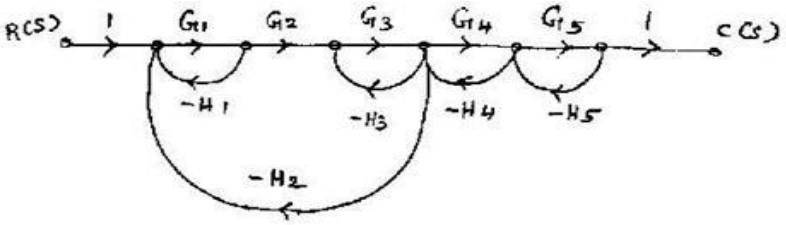
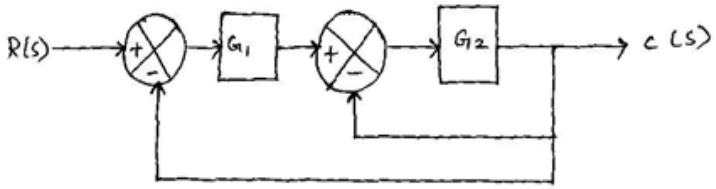
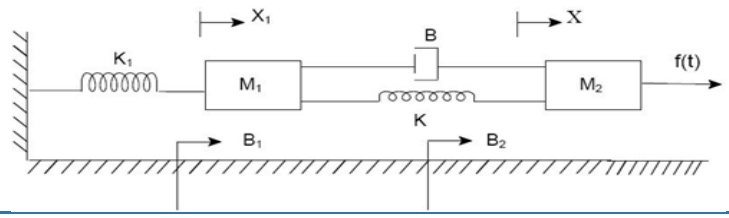
4.	Analyze the transfer function of the electric circuit shown in figure 	BTL 4	Analyzing
5.	Explain the working of simple hydraulic systems in detail.	BTL2	Understanding
6.	Explain the working of simple thermal systems in detail.	BTL2	Understanding
7.	From the mechanical system show in fig draw the Force-Voltage and Force – Current Electrical Analogous 	BTL2	Understanding
8.	From the mechanical system show in fig draw the Force-Voltage and Force – Current Electrical Analogous 	BTL2	Understanding

PART - C			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Deduce the transfer function of system shown in figure (15) 	BTL 6	Creating
2.	Explain the flight control system.	BTL2	Understanding
3.	Estimate the transfer function for the following electrical network. 	BTL 5	Evaluating

UNIT – II – OPEN AND CLOSED LOOP SYSTEMS			
PART- A			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Compare the Open loop System with Closed loop System.	BTL 4	Analyzing
2.	List the advantages of Closed loop System?	BTL 1	Remembering
3.	What are the Properties of Signal flow graphs?	BTL 1	Remembering
4.	Give Mason's gain formula of Signal flow graph.	BTL 2	Understanding
5.	Discuss about the block diagram and its components of a control system.	BTL 2	Understanding
6.	Assess feedback and its types employed in Control system.	BTL 4	Analyzing
7.	Negative feedback is preferred in control system. Justify	BTL 5	Evaluating
8.	Illustrate any two rules to be followed in block diagram reduction techniques.	BTL 3	Applying
9.	Analyze non-touching loops.	BTL 4	Analyzing
10.	Interpret signal flow graph	BTL 2	Understanding
11.	What are the advantages of feedback systems?	BTL 1	Remembering
12.	What are the components of control system?	BTL 1	Remembering

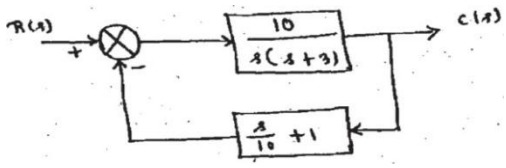
PART- B			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	How could you determine the Transfer Function of the system Shown in the fig. 	BTL 5	Evaluating

2.	(i) Design the Block diagram to its Canonical form and obtain C(s)/R(s). 	BTL 6	Creating
3.	Solve C/R for the signal flow graph shown below. (13) 	BTL 3	Applying
4.	(i) State any five block diagram reduction rules with example. (8) (ii) Mention in detail about any five terminologies used in signal flow graph. (5)	BTL1	Remembering
5.	Estimate the overall transfer function of the system shown in the fig.  Fig(i) (7) (ii)Estimate the overall transfer function of the system shown in the fig.  Fig(i) (6) (5)	BTL2	Understanding

PART - C			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Solve X2/X1 using state Mason's gain formula and state it. (15) 	BTL 5	Evaluating
2.	(i) Can you predict the C/R for the Signal flow graph shown below using Mason's gain formula. (8)  (ii) Compile the Transfer Function C(S)/R(S) of block diagram shown below. (7) 	BTL2	Understanding
3.	Demonstrate the differential Equations governing the mechanical system shown in the fig. and determine the transfer function. (13) 	BTL2	Understanding

UNIT – III – CHARACTERISTICS EQUATION AND FUNCTIONS			
PART- A			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Illustrate how a Control system is classified depending on the value of damping ratio?	BTL 3	Applying
2.	List the advantages of generalized error coefficients.	BTL 1	Remembering
3.	Generalize why derivative controller is not used in Control systems.	BTL 6	Creating
4.	Give steady state errors to a various standard inputs for type 2 systems.	BTL 2	Understanding
5.	What is meant by peak overshoot?	BTL 1	Remembering
6.	Mention steady state error.	BTL 1	Remembering
7.	Define rise time.	BTL 1	Remembering
8.	The damping ratio and natural frequency of a second order system are 0.5 and 8 rad/sec respectively. Calculate resonant peak and resonant frequency.	BTL 3	Applying
9.	With reference to time response, Examine peak time.	BTL 4	Analyzing
10.	Describe the transient and steady state response of control system?	BTL 2	Understanding
11.	Outline the response of the second order under damped system.	BTL 2	Understanding
12.	Point out the time domain specifications.	BTL 4	Analyzing
13.	Summarize the generalized error and static error constants.	BTL 5	Evaluating
14.	Compare position, velocity error constants.	BTL 4	Analyzing
15.	Demonstrate the test signals used in time response analysis.	BTL 3	Applying
16.	Label a step signal.	BTL 1	Remembering
17.	Formulate ramp, parabolic and impulse signal.	BTL 6	Creating

PART- B			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	For a unity feedback system with overall transfer function G(S)=1/S(S+1).Find the Damping factor , Un damped natural frequency, Peak time, Maximum overshoot. (13)	BTL2	Understanding
2.	How will you explain the meaning of for Rise time, fall time, settling time, peak overshoot with expressions? (13)	BTL 2	Understanding
3.	The open loop transfer function of a unity feedback control System is G(S)=K/S(S+1). For a particular value of K the peak overshoot is 50%.By how much value of K be increased so as to reduce the peak overshoot by half. (13)	BTL 3	Applying
4.	The open loop transfer function of a unity feedback system is given by G(s)=K/S(TS+1) where K and T are positive constants. By what factor should the amplifier gain be reduced so that the peak overshoot of unit step response of the closed loop system is reduced from 75% to 25%.	BTL 5	Evaluating
5.	(i) A unity feedback system has G(S)=1/S(1+2S). The input to the system is described by $r(t)=2+4t+6t^2$. Determine the generalized error coefficients and express the steady state error as a function of time. (8) (ii) For a system with GH(s)=5/S+5, Calculate the generalized error coefficients and steady state error. Assume r(t)=6+5t. (5)	BTL 4	Analyzing
6.	(i) What are the various standard test signals? Draw the characteristics diagram and obtain the mathematical representation of all. (7) (ii). Write the response of un damped second order system for unit step input. (6)	BTL 1	Remembering
7.	Derive the time response analysis of a first order system for step and ramp input. (13)	BTL1	Remembering
8.	(i) A unity feedback system with unit step input for which open loop transfer G(S)=16/S(S+8) .Solve for the transfer function, the natural Frequency, the damping ratio and the damped frequency of oscillation. (7) (ii) Calculate the delay time, rise time and peak overshoot for the system whose natural frequency of oscillation is 10rad/s and damping factor 0.707. (6)	BTL 3	Applying

PART - C			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	(i) What inference can you make about the unit step response of the control system shown in the fig. (6)  The open loop transfer function of a unity feedback system is given by G(S)=20/S(S+2 .The input function is $r(t) = 2 + 3t + t^2$. Examine the generalized error coefficient and steady state error.	BTL 4	Analyzing
2.	Analyze the steady state errors for unit step, unit ramp and unit acceleration input. For a unity feedback system characterized by the open loop transfer function G(s) =1/S(0.5S+1)(0.2S+1). Also determine the damping ratio and natural frequency of dominant errors. (13)	BTL 4	Analyzing
3.	(i) A certain unity negative feedback control system has the following open loop transfer function G(s) = 10(S+10)/S(S+2). Derive an expression for the output Variable as a function of time when the input applied is unit step. What is the percentage overshoot, peak time and rise time? (7) (ii)For unity feedback system having G(S) = $5(S+1)/S^2(S+3)(S+10)$. Determine the type of system, error Coefficients and the steady state error, $r(t) = 1 + 3t + t^2$. (8)	BTL 6	Creating
4.	Determine the open loop transfer function for a unit feedback control system with unit impulse response given by $c(t) = -te^{-t} + 2e^{-t}$ for (t>0). (15)	BTL 5	Evaluating

UNIT – IV – CONCEPT OF STABILITY			
PART- A			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Illustrate limitations of Routh Hurwitz criterion	BTL 3	Applying
2.	Report the advantages of Nyquist stability over roots stability criterion	BTL 3	Applying
3.	Explain stability of the system	BTL 4	Analyzing
4.	Asses the Routh stability criterion	BTL 5	Understanding
5.	What is the advantage of using root locus for design	BTL 1	Remembering
6.	Express the rules of obtain the breakaway point in root locus	BTL 2	Understanding
7.	What is Centroid?	BTL 1	Remembering
8.	Quote Root locus	BTL 1	Remembering
9.	Associate the necessary and sufficient condition for stability.	BTL 2	Understanding
10.	Mention asymptotes. How will you find the angle of aysmptotes?	BTL 2	Understanding
11.	Elaborate the Parameters which constitute frequency domain Specifications	BTL 6	Creating
12.	What is bode plot?	BTL 1	Remembering
13.	What are the advantages of bode plot?	BTL 1	Remembering
14.	Draw the bode plot of $G(s)=K/S^n$.	BTL 6	Creating
15.	What is approximate bode plot?	BTL 1	Remembering

PART- B			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Sketch the root locus .A unity feedback control system has an open loop transfer function $G(S)=K/S(S^2+4S+I3)$.	BTL 5	Evaluating
2.	Sketch the root locus of the system whose open loop transfer function is $G(S)=K/S((S+2)(S+4))$.Find the value of K so that the damping ratio of the closed loop system is 0.5.	BTL 5	Evaluating
3.	The open loop transfer function of a unity feedback system is given by $G(S)=K(S+9)/S(S^2+4S+11)$. Sketch the root locus of the system.	BTL 5	Evaluating
4.	Sketch the root locus .A unity feedback control system has an open loop transfer function $G(S)=K/S(S^2+6S+I0)$	BTL 5	Evaluating
5.	Investigate the stability of this characteristics equation given $S^3+20S^2+9S+100=0$	BTL 6	Creating
6.	Use Routh Hurwitz criterion and determine the stability of the following system whose characteristics equation is $S^6+2S^5+8S^4+12S^3+20S^2+12S+K=0$.	BTL 5	Evaluating

PART - C			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Sketch the root locus for the unity feedback system whose open loop transfer function $G(S)H(S)=K/S(S+4)(S^2+4S+20)$	BTL 5	Evaluating
2.	Sketch the root locus for the unity feedback system whose open loop transfer function $G(S)H(S)=K(S+1.5)/S(S+1)(S+5)$	BTL 5	Evaluating
3.	Sketch the root locus for the unity feedback system whose open loop transfer function $G(S)=K(S^2+6S+25)/S(S+1)(S+2)$	BTL 5	Evaluating

UNIT – IV – SAMPLED DATA SYSTEMS			
PART- A			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	What is the need for a controller?	BTL 1	Remembering
2.	What are the different types of controllers?	BTL 1	Remembering
3.	What is Proportional controller and what are its advantages?	BTL 1	Remembering
4.	Mention the stability condition for a sampled data control system.	BTL 2	Understanding
5.	Draw the generalized block diagram of a closed loop sampled data control system.	BTL 1	Remembering
6.	What are the drawbacks in proportional controller.	BTL 1	Remembering
7.	List he advantages and disadvantages in integral controller.	BTL 1	Remembering
8.	List any two advantages of digital controller.	BTL 3	Applying
9.	Give the mathematical expression for the output of a digital PID controller.	BTL 4	Analyzing
10.	What is sampling time.	BTL 1	Remembering
11.	What is the role of D controller in a PID control scheme.	BTL 1	Remembering

PART- B			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	From the fundamentals, derive an expression for the velocity form of digital PI and PID control algorithms	BTL2	Understanding
2.	Explain in detail the functional block diagram of a direct digital control scheme with the help of a neat diagram	BTL 4	Analyzing
3.	Explain digital PID controller in detail?	BTL 4	Analyzing

PART - C			
S.NO	**QUESTIONS**	**BT BTL**	**COMPETENCE**
1.	Write the relevance of PI controller in the stability and steady state error of a system	BTL 4	Analyzing
2.	Describe the two different ways that can be used to improve the quality of reconstruction of a continues signal from its discrete time values in a ddc. out line advantages and disadvantages	BTL 4	Analyzing