DEPARTMENT OF MECHANICAL ENGINEERING
AUTOMATIC CONTROLS

VI Semester

Q.1. Define transfer function. derive transfer function of an armature controlled D. C motor

Q.2. ComparisonofBlockdiagram andsignal flowgraphmethod

Q.3. Differentiatebetweenlinear andnon-linearsystem withexamples

Q.4. Differentiatebetweencontinuousanddiscretesignal.

Q.5. Differentiatebetweentimeinvariantandtimevaryingsystem.

Q.6. Givetheeffectofparametervariationin closed loop system

Q.7. Whatis signalflowgraph?

Q.8. Whatis ablockdiagram?

Q.9. Whatis system?

Q.10. Whatis controlsystem?

Q.11. Defineopenloopandclosedloopsystems.

Q.12. Define closedloopsystems.

Q.13. Stateprinciple ofsuperpositiontheorem.

Q.14. Whatis timevariant andTimeinvariant?

Q.15. Define transferfunction.

Q.16. Whatis signalflowgraph.

Q.17. Definenon-touchingloop.

Q.18. Whatis time response?

Q.19. Whatis transient response

Q.20. Whatis steadystateresponse

Q.21. Namethetest signals usedin timeresponse analysis.

Q.22. Whatis dampedfrequencyof oscillation?

Q.23. Listthetime domainspecifications.

Q.24. Define rise time,delaytime.

Q.25. Definedamping ratio.

Q.26. Whatisfrequencyresponseanalysis?

Q.27. Whatis Nichol'schart?

Q.28. Define gaincrossoverfrequency?

Q.29. Define Phasecrossoverfrequency?

Q.30. Define PhaseMargin?

Q.31. Define Gain Margin?

Q.32. ListtheFrequencydomainspecifications?

Q.33. Whatis cornerfrequency?

Q.34. Whatis Bandwidth?

Q.35. Write a note on magnetic amplifier

Q.36. Write a note on A.C Servomoter

Q.37.   Write a note on Bode Plot

Q.38.   Write a note on Masons gain formula

Q.39.   What do you mean by lead lag, lead lag compensator? Explain

Q.40.   State and Explain Nyquist stability criterion

Q.41.   What is the need of introducing compensating n/w in a system?

Q.42.   Write a note on Servo mechanism.

Q.43.   Write a note on Synchros

Q.44.   Write a note on A.C and D.C tecogenerators?

Q.45.   Write a note on P.I.D controller?

Q.46.   Correlation between time domain &frequency Domain for second order control system?

Q.47.   A unity feedback system is characterized by an open loop transfer function

$$G(S){=}\frac{k}{s(s{+}10)}$$

Q.48.   Determine the overall gain K, so that the system will have a damping ratio of 0.5 for this value of K, determine settling time, peak over shoot, rise time and time to peak overshoot for the step i/p

Q.49.   Using Routh- Hurwitz criterion, find the stability of a linear control system with characteristic equation $S^5 +4s^4 +8s^2 +7s +4= 0$ for a system having *T.F-64/s^2 +5s+64*, for unity step i/p determine

a) w_n

b) w_d

c)   time for peak overshoot

Q.50.   Comment on the stability of the system?
$$S^4 +2S^3+6S^2 + 10S+ 3$$

Q.51.   Examine stability
$$S^6+3S^5+4S^4 +5S^2+3S+2= 0$$

Q.52.   For a unity feedback system

$$G(S){=}\frac{K}{S(S{+}4)(S{+}2)}$$ Sketch the root locus

$$G(S)H(S){=}\frac{K(S{+}1)}{S(S{-}1)(S^2{+}5S{+}25)}$$ sketch the root locus

Q.53.   Draw the root locus plot of a feedback system with characteristic equation

$$\frac{1{+}K}{S(S{+}3)(S^2{+}2S{+}2)}{=}0$$

Q.54.   A feedback system has $G(S)R(S){=}\frac{100(S{+}4)}{S(S{+}5)(S{+}10)}$ Draw the bode plot and comment on stability

Q.55.   Explain Nyquist stability criterion to determine the stability of closed -loop systems

Q.56. The open loop transfer function of a closed- loop systems is given by.
$$G(S) R(S) = 11 S (S+1) (1 +2S)$$

Q.57. Determine the stability using Nyquist stability criterion

Q.58. Sketch the bode plot for the system whose open loop transfer function is given by:
$$G(S)H(S)=\frac{2(S+0.25)}{S^2(S+1)(S^2+0.5)}$$

Q.59. Explain Nyquist Stability criterion. The open-loop transfer function of closed-loop system is given by
$$G(S)H(S)=\frac{4S+1}{S^2+(S+1)(2S+1)}$$

Q.60. The open loop transfer function of a unity feedback control system is given by
$$G(S)=\frac{K}{(S+2)(S+4)(S^2+6S+25)}$$

By applying Routh Stability criterion, discuss the stability of the closed-loop system as a function of K. Determine the values of K which will cause sustained oscillations in the closed-loop system. What are the corresponding oscillation frequencies?
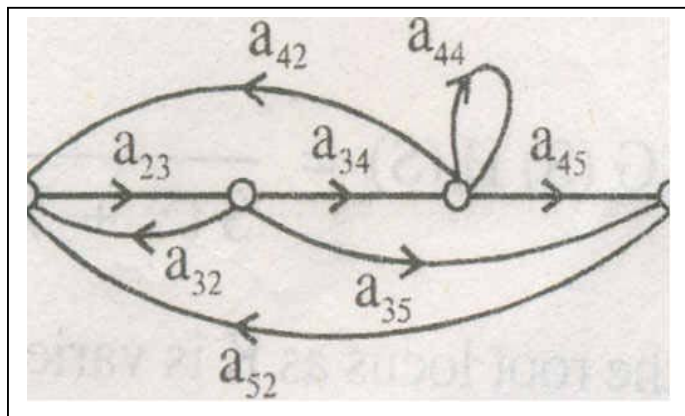
Q.61. The open loop transfer of a servo system with unity feedback is
$$G(S)=\frac{10}{S(0.1S+1)}$$ Evaluate the static error constants for the system

Q.62. Discuss the effects of feedback on sensitivity to parameter variations in control systems

Q.63. C /Rfrom the signal flow graph given below:

Q.64. Find out the time response of a second order system due to unit step input. Draw the response for under damped case and find steady state error.

Q.65. determine the stability of a closed loop control system whose characteristics equation is $S^5+S^4+2S^2+11S+10=0$ using Routh array

Q.66. A unity feedback control system has its open –loop transfer function given by

$$G(S) = (4S+1)/4S^2$$

Q.67. Determine an expression for the time response when the system is subjected to
     i.   Unit impulse input function and
     ii.   Unit step function

Q.68. The forward path transfer function of a unity feedback control system is given by

$G(S)=\dfrac{2}{S(S+3)}$ Obtain an expression for the unit step response of the system.

Q.69. sketch the root locus plot for the system when open loop transfer function is given by

$G(S)=\dfrac{K}{S(S+4)(S^2+4S+13)}$

Q.70. The open loop transfer function of a unity feed back control system is given by

$G(S)=\dfrac{K}{S(1+0.2S)}$

Determine a suitable compensator such that the system will have $K_v= 10$ and P.M $=50^0$

Q.71. The open - loop transfer function of a feedback control system is given

$G(S)H(S)=\dfrac{K}{(S+1)(2s+1)(3s+1)}$ Find the value of K such that the gain margin is

20db

Q.72. What do you mean by rise time, time-delay, peak overshoot and steady state error in second –order system?

Q.73. Distinguish between
     a. Linear and non-linear control systems
     b. Time invariant and time varying system'
     c. Continuous and discrete data control system

Q.74. A unity feedback system is characterised by an open loop transfer function

$G(S)=\dfrac{k}{s(s+10)}$

Determine the gain K so that system will have a damping ratio of 0.5. For this value of K,

Q.75. Determine settling time, over shoot, rise time and time peak overshoot for a unit step i/p

Q.76. Determine the stability of a system using Nyquist stability criterion .Examine the stability of a system having open loop transfer function as

$G(S)H(S)=\dfrac{4s+1}{S^2(s+1)(2s+1)}$

Q.77. What is the need of introducing compensating networks in a system? Describe Phase –Lead compensation in detail

Q.78. Illustrate the effect of integral control action on second order system

Q.79. For the block diagram given in fig1 draw the signal flow graph and derive the expression for C/R using masons gain formula

Fig 1
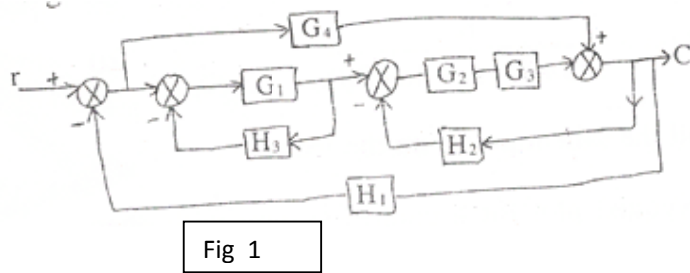
Q.80. Derive the expression for C/R for the fig given blow using masons gain formula
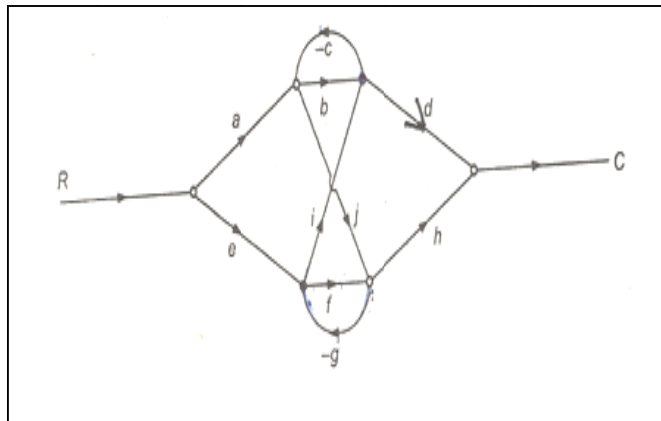
Q.81. Plot the root locus for a system whose open loop transfer function is given below
$$G(S)H(S)=\frac{k}{s(s+4)(s^2+4s+20)}$$

Q.82. Plot the root locus for a system whose open loop transfer function is given below
$$G(S)H(S)=\frac{k}{s(s+10)(s^2+4s+8)}$$

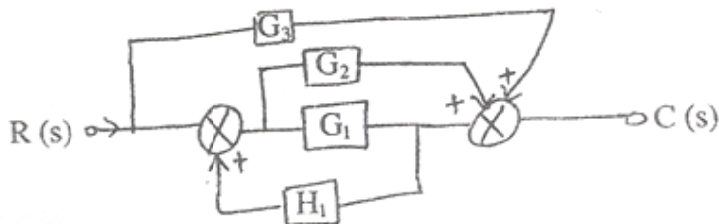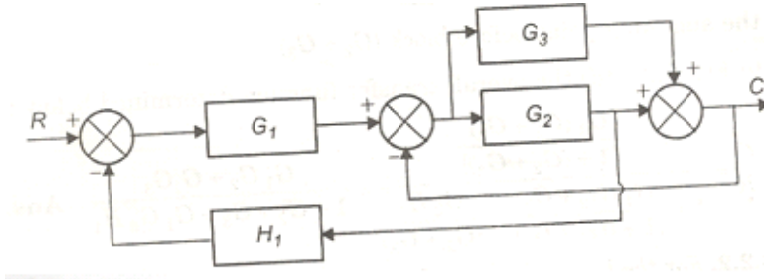Q.83. Using the block diagram reduction techniques, calculate the transfer function as shown in fig 2

Fig. 2

Q.84. Using the block diagram reduction techniques, calculate the transfer function of the fig given below

Q.85. SketchtheNyquistPlotforasystemwiththeopenlooptransferfunction

$$G(S)H(S)=\frac{K(1+0.5S)(1+S)}{(1+10S)(S-1)}$$ Determinethe range ofkforwhichclosedloopsystemisstable.

Q.86. ConstructNyquistPlotforasystemwiththe openloop transferfunction

$$G(S)H(S)=\frac{5}{s(1-s)}$$ .Commentonthestabilityof openloop andclosedloop system.

Q.87. ByNyquist stabilitycriterion determine thestabilityof closedloop system,whoseopenlooptransferfunction is given by, G(S)H(S)= (s+2)/(s+1)(s-1)

Q.88. ConstructRoutharrayand determine thestabilityofthesystemrepresentedbythecharacteristicsequation $s^5+s^4+2s^3+2s^2+3S+5=0$.Commenton thelocation oftherootsofcharacteristicequation.

Q.89. ConstructRoutharrayanddetermine thestabilityof thesystemrepresentedbythecharacteristicsequation $s^7+9s^6+24s^4+24s^3+24s^2+23S+15=0$commentonthelocation oftheroots of characteristic equation.

Q.90. PlottheBodediagramforthefollowingtransferfunctionandobtain thegainandphasecrossover frequencies. $G(S)H(S)=\frac{10}{S(1+0.4S)\,(1+0.1S)}$

.Theopenlooptransferfunctionof aunityfeed backsystemisG(S)=1/S(1+S) (1+2S).Sketch the Polarplotanddetermine theGainmarginand Phasemargin.

Q.91. SketchtheBodeplot andhencefind Gaincross overfrequency,Phasecross overfrequency, Gainmargin andPhasemargin.

$$G(S)=\frac{0.75(1+0.2S)}{S(1+0.5S)\,(1+0.1S)}$$

Q.92. SketchtheBodeplot andhencefind Gaincross overfrequency, Phasecross overfrequency, Gain margin andPhasemargin. $G(S)=\frac{10(S+3)}{S(S+2)\,(S2+4S+100)}$

Q.93. Sketchthepolarplotforthefollowingtransferfunction .andfindGain cross overfrequency,Phasecross overfrequency, GainmarginandPhasemargin.

$$G(S) = \frac{10(S+2)(S+4))}{S(S^2-3S+10)}$$

Q.94. Constructthepolarplotforthefunction $G(S)H(S) = \frac{2(S+1)}{S^2}$ .findGain crossoverfrequency,Phasecross overfrequency, GainmarginandPhasemargin.

Q.95. PlottheBodediagramforthefollowingtransferfunctionandobtain

thegainandphasecrossover frequencies $G(S) = \frac{KS^2}{(1+0.2S)(1+0.02S)}$

.Determinethevalueof Kfora gaincrossoverfrequencyof 20rad/sec

Q.96. Sketchthepolarplotforthefollowingtransferfunction .andfindGain cross overfrequency, Phasecross overfrequency, Gain margin andPhasemargin.

$$G(S) = \frac{400}{S(S+2)(S+10)}$$

Q.97. Aunityfeedback systemhasopenloop transferfunction

$G(S) = \frac{20}{S(S+2)(S+5)}$ .UsingNichol'schart.Determinetheclosedloop

frequencyresponseandestimateallthefrequencydomainspecifications.

Q.98. Construct Nyquist plot for a feedback control system whose open loop transfer

function is given by $G(S)H(S) = \frac{5}{S(1-S)}$ .Comment on the stability of open loop and

closed loop transfer function.

Q.99. SketchtheBodeplot andhencefindGaincross overfrequency, Phasecross overfrequency, Gain margin andPhasemargin.

$$G(S) = \frac{10(1+0.1S)}{S(1+0.01S)(1+S)}$$

Q.100. Draw a signal flow graph and evaluate the closed loop transfer function of a system whose block is shown in fig.