JAYA GROUP OF INSTITUTIONS – THIRUNINRAVUR

4TH SEMESTER – B.E / B.Tech.

INTERNAL ASSESSMENT - II (MODEL EXAMINATION - II)

Sub.Name: **CONTROL SYSTEM ENGINEERING** Date:**11/03/2015**

Sub.Code: **EC 6405** Branch: **ECE**

Duration: 180 Minutes Max.Marks:100

PART – A (10X2=20) Answer all questions

1.What is frequency response?

2.What are frequency domain specifications?

3.Define gain margin.

4.Find type and order of the system, $G(s)= 1/ [s^2(s+1)(s+2)]$.

5.What is Nichols plot?

6.Define stability.

7.What is Nyquist stability criterion?

8.Determine angle of asymptote and centroid.

9.What is dominant pole?

10.Construct routh array for the system, $s^2+2s+3=0$.

PART – B (5X16=80) Answer the questions as per the choice

11(a).For the following transfer function draw bode plot and obtain gain cross-over frequency, $G(s)=20 / [s(1+3s)(1+4s)]$. (16)

Or

(b).Sketch bode plot for the following transfer function and determine the system gain K for the gain cross-over frequency 5 rad/sec, $G(s)=Ks^2 / [(1+0.2s)(1+0.02s)]$. (16)

12(a).The open loop transfer function of a unity feedback system is given by $G(s)=1/[s(1+s)(1+2s)]$.Sketch the polar plot and determine the gain margin, phase margin.(16)

Or

(b).Consider a unity feedback system having an open loop transfer function, $G(s)=K/[s(1+0.5s)(1+4s)]$. Sketch the polar plot and determine the value of K so that (i)gain margin is 20db and (ii)phase margin is 30^0. (16)

13(a).Derive the expressions for M and N circles. (16)

Or

(b)(i).Construct routh array and determine the stability of the system whose characteristic equation is $s^6+2s^5+8s^4+12s^3+20s^2+16s+16=0$. Also determine the number of roots lying on right half of s-plane, left half of s-plane and on imaginary axis. (8)

(ii).By routh stability criterion determine the stability of the system represented by the characteristic equation, $9s^5-20s^4+10s^3-s^2-9s-10=0$. Comment on the location of roots of characteristic equation. (8)

14(a).A unity feedback control system has an open loop transfer function, $G(s)=K/[s(s^2+4s+13)]$. Sketch the root locus. (16)

Or

(b).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. (16)

15(a).Draw the Nyquist stability plot for the system whose open transfer function is, $G(s)H(s)=K/[s(s+2)(s+10)]$. Determine the range of K for which the closed loop system is stable. (16)

Or

(b)(i).Determine Nyquist stability criterion for the closed loop system, whose open loop transfer function is given by, $G(s)H(s)=(s+2)/[(s+1)(s-1)]$. (8)

(ii).Construct routh array and determine the stability of the system represented by the characteristic equation, $s^5+5s^4+2s^3+2s^2+3s+5=0$. (8)

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4 mark