EE - 801

B.E. VIII Semester

Examination, June 2016

Control System

Time : Three Hours *Maximum Marks : 70*

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

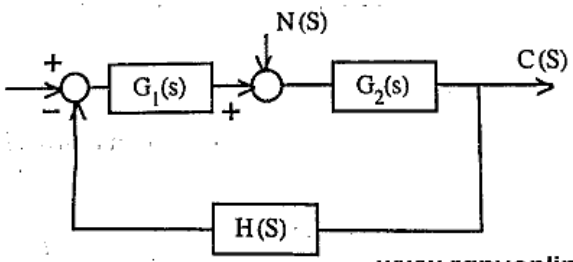
ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) What is Regenerative feedback system? Why it is normally not used in control system.

b) Find out the transfer function $\frac{C(s)}{N(s)}$ of the system given below:



c) Assuming a simple mechanical system of mass M, damper and spring give its force-current analogy.

d) Explain with a neat sketch explain the working of "Synchro" error detector.

OR

Represent the following set of equations by a signal flow graph and determine the overall gain relating x_5 and x_1 using Mason's gain formula:

$x_2 = ax_1 + fx_2 \qquad x_3 = bx_2 + ex_4$

$x_4 = cx_3 + hx_5 \qquad x_5 = dx_4 + gx_2$

2. a) For the given open loop transfer function

$$G(s)H(s) = \frac{2\left(s^2+3s+20\right)}{s(s+2)\left(s^2+4s+10\right)}$$

Determine the static velocity error co-efficient k_v and e_{ss} for input given as $4t$.

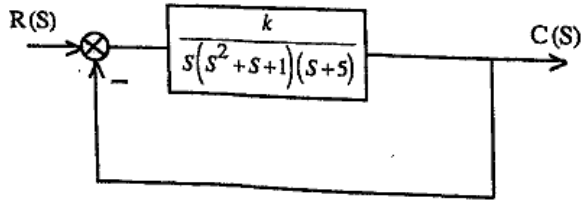
b) What are the conditions and problems in forming Routh-Hurwitz array?

c) If a second order system has pole at $(-1\pm j)$, then when does the step response of the system will exhibit a peak value.

d) With the help of a neat block diagram explain the working of a PID controller.

OR

A closed loop control system is shown below. Determine the range of k for stability.



3. a) What is "Breakaway points" in root locus. Determine breakaway points for $G(s)=\frac{k}{s(s+4)}$

b) Determine the angle of asymptotes for the open loop Transfer Function.

$$G(s)=\frac{k}{s(s+1)(s+3)}$$

c) Draw the root locus plot of the open loop TF

$$G(s)H(s)=\frac{k}{s(s+2)(s+4)}$$

d) State the salient features of root locus plot.

OR

Explain the effect of addition of open loop poles and zero on root locus given the OLTF

$$G(s)H(s)=\frac{k}{s(s+4)}$$

4. a) What is bode plot? Why it is plotted? State the advantage of plotting it on a semi log sheet.

b) Explain Nyquist criteria in brief.

c) Plot the magnitude and phase angle plot for the following:

i) Constant k

ii) $\frac{1}{(j\omega)^N}$

d) Sketch the bode plot for the OLTF for the unity feedback system given below:

Also assess the stability. Determine PM and GM

$$G(s)=\frac{50}{(s+1)(s+2)}$$

OR

If $GH=\frac{k(s-1)}{s(s+1)}$, investigate the stability of the system using Nyquist criteria.

5. Derive the transfer function of the following:

a) Phase lead compensation

b) Phase lag compensation

c) How the drawbacks of the above networks is overcome by using phase-lag-lead compensation network. Explain briefly with neat sketch.

d) Write the design procedure for a phase lead compensation using bode plot.

OR

Write the design procedure for a phase lag compensation using bode plot.

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