Code No. 2334 / N

FACULTY OF ENGINEERING

B.E. 3/4 (EE/Inst.) I-Semester (New) Examination, November / December 2012

Subject : Linear Control Systems

Time : 3 Hours **Max. Marks: 75**

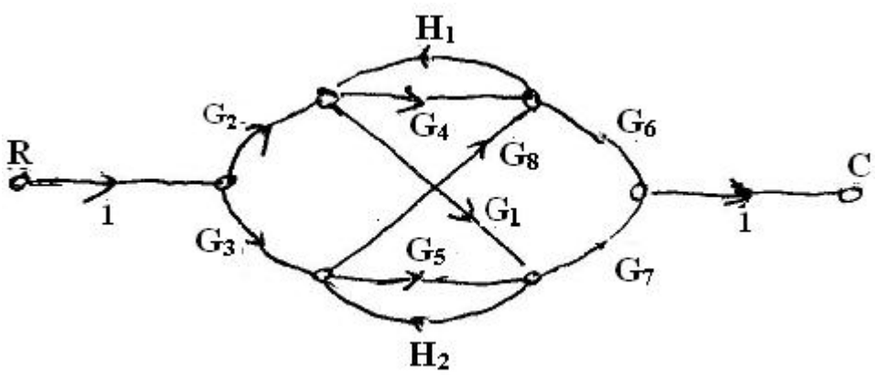
Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1. Write the analogous electrical and mechanical quantities based on force voltage analogy. (2)
2. Draw the signal flow graph for the equation $\frac{d^2y}{dt^2}+\frac{2}{5}\frac{dy}{dt}+\frac{11}{6}y=x$ (3)
3. Obtain the response for a feedback system with G(s)=1/ τs for unit step input. (3)
4. Determine the value of K, for the system whose closed loop transfer function is $T(s)=K/s^2+5s+K$, for the system for unit step input will have 10% overshoot. (2)
5. Compare time domain analysis and frequency domain analysis. (3)
6. A second order type-1, system has following constants K=4, T_1=1, T_2=1/3. Calculate for this system the value of gain margin. (2)
7. What are the advantages of state space representation? (2)
8. Prove $\Phi^{-1}(t) = \Phi_{(-t)}$ (3)
9. What is quantization process?
10. Determine the time function, for the function whose z-transform is given by F(z)=0.6/(z-0.5)(z-0.7). (3)

PART – B (5x10=50 Marks)

11.(a) Obtain the overall transfer function C/R from the signal flow graph shown below. (7)



(b) Draw the complete block diagram representation of armature controlled D.C. Motor. (3)

12. Sketch the root locus of the system $G(s)H(s)=\frac{K(s+5)(s+40)}{s^3(s+200)(s+1000)}$

Find

(a) Centroid and angles of asymptotes

(b) Angles at which the root town leaves the real axis at s=0

(c) Find the values of K for which the root locus crosses the imaginary axis

At what points the root locus crosses the jω-axis. (10)

13. Draw the Bode magnitude and phase angle plots for the transfer function. (10)

$$G(s)=\frac{2000(s+1)}{s(s+10)(s+40)}$$

14. Obtain the companion form of state model for the system whose transfer function is given by (10)

$$T(s)=\frac{Y(s)}{U(s)}=\frac{2}{s^3+s^2+2s+3}$$

..2

15.(a) Find the z-transforms of the following: (6)

(i) $x[n]=n\,\alpha^n\,u[n]$

(ii) $x[n]=-(10)^n\,u[-n-1]$

(b) Obtain z-transform for ramp input function. (4)

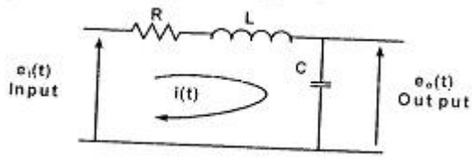
16. The transfer function of an open-loop control system is given by $G(s)=K/s(s+1)$. (10)

Design a compensating network to suit the following specifications:

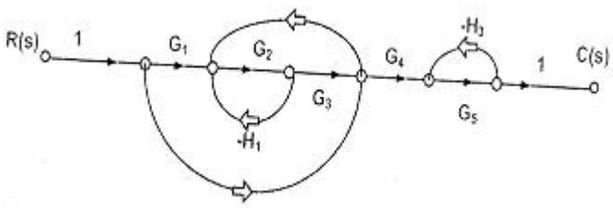
(i) The phase margin must be greater than 40

(ii) The velocity constant is greater than or equal to 12/sec

17.(a) Obtain the ξ and ω_n for the circuit shown below: (5)



(b) Determine the overall transfer function of the system whose signal flow graph is given below: (5)



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