Ex/BESUS/ EE-603/06

B.E. (EE) Part-III 6th Semester Examination, 2006

Control System-I

(EE-603)

Time : 3 hours   Full Marks : 100

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1. a) Define transfer function. State the significance of transfer function. State its limitations.

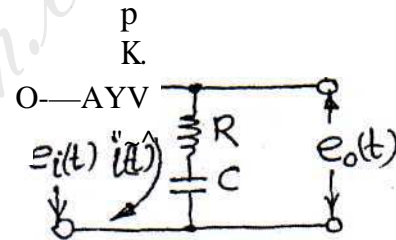   b) Derive the transfer function of the network shown in Fig.-1.

Fig.-1   [8+8]

2. a) Draw the block diagram of the circuit shown in Fig.-2.

   b) Determine the transfer function of the block diagram shown in Fig.-3.
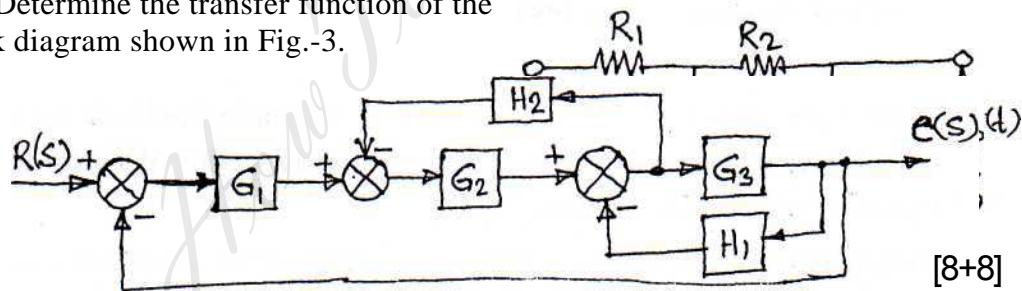
Fig.-3   [8+8]

3. a) Draw the Signal Flow graph of Fig.3.

   b) Determine the time response of a first order system with step and ramp inputs. Define time constant.   [8+8]

4. Obtain the response of the Second Order System with unit step input under different damping conditions.   [16]

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(EE-603)

Short notes (<u>any two</u>) :   [8+8]
   a) Type and order of system
   b) Static Error Co-efficient
   c) Synchronous system
   d) Function of demodulators and its realisation with diodes.

SECOND HALF

6. a) How can you assess relative stability by gain margin and phase margin?

    b) i)   Draw the Nyquist Plot for a unity feedback system with open loop transfer function:
             _____

        ii) Now find range of K for stability of the closed loop system.   [4+10+2]

7. a) Draw the complete root loci for 0 < K < oo for the unity feedback system with open loop transfer function :
$$G(s) = \frac{K(s + 6)}{(s^2+10s +26)(s+1)^2}$$ _____
        Now that solution to 4^ = 0 gives: s = -6.8, -4 ±j 0.5,-1
                          ds

    b) What is a 'centroid' and a 'break away point' in a root locus?   [14+2]

8. a) Draw the Bode Plot for the transfer function G(s) given in 7(a) taking K= 10. Find the Gain margin and Phase margin of the system from the Bode Plot.

    b) What are M-circles? What is their use?   [12+4]

9. a) What is a Nichol's chart?

    b) Deduce for a standard second order system with unity feedback the expression of the resonance peak and resonance frequency as a function of the damping ratio and natural frequency of oscillation.

    c) Highlight the constructional features and operation of a two phase A.C. Servomotor and a closed-loop application of it.   [2+7+7]

10. a) Define cut-off frequency and bandwidth.

    b) Describe a simplified operation of a tacho generator.

    c) Deduce the transfer function of a d.c. servomotor and mention its difference from a d.c. motor.

    d) What is a strictly proper system?   [2+6+7+1]