Code No: R1622042 **R16** SET - 1

II B. Tech II Semester Regular Examinations, November - 2018
CONTROL SYSTEMS
(Com to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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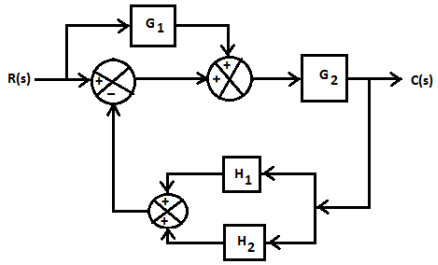
PART –A

1. a) Compare the open-loop and closed-loop control systems. (2M)
   b) What is steady state error and derive it (2M)
   c) What are Standard test signals? (3M)
   d) What are effects of adding poles to G(s) H(s) on the root loci? (2M)
   e) What is polar plot? Draw the polar plot of G(s)=1/(3+ST) (3M)
   f) Explain about obsevability? (2M)

PART -B

2. a) Using block diagram reduction techniques obtain the transfer function C(s)/R(s) for the block diagram below. (7M)



   b) Derive the transfer function and develop the block diagram of Armature controlled DC servo motor. (7M)

3. a) Derive the time domain specifications of second order system with unit step input. (7M)
   b) Find the step, ramp and parabolic error coefficients and their corresponding steady-state errors for unity feedback system having the following transfer function (7M)

$$G(S) = \frac{6(S+2)}{S(S+3)(S^2+2S+5)}$$

4. a) Explain the procedure to draw root locus of a given transfer function. (7M)
   b) A feedback system has the open loop transfer function of : (7M)
   $G(s) = (K e^{-s}) / (s(s^2+2s+4))$. Find the limiting values of K for maintaining stability.

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5. a) The characteristic equation of a linear control system is given below: $s^2+4s+2+k=0$. Using Nyquist Stability Criterion, determine the range of K for the system to be stable. (7M)
   b) Using Routh-Hurwitz criterion, determine the stability of the closed loop system that has the following characteristic equation and also determine the number of roots that are in the right half s-plane and on the imaginary axis: $S^3+2s^2+s+4=0$. (7M)

6. a) Discuss the effect of Proportional controller and PD controller on performance of a control system. (7M)
   b) A unit feedback system has an open loop transfer function: $G(s) = K/s(s + 2)(0.3s + 1)$. Design a phase lag compensator to meet the following specifications: Velocity error constant = 10 .Phase margin $\geq 40^0$. (7M)

7. a) Discuss the concept of controllability and observability with an example (7M)
   b) Given the state equation $\dot{X} = AX, Where\ A = \begin{bmatrix} -3 & 1 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & -2 \end{bmatrix}$ (7M)
   Determine the state transition matrix.