Reg. No. : | | | | | | | | | | | |

# Question Paper Code : 10321

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fourth Semester

Electrical and Electronics Engineering

EE 2253/131403/EE 44/EE 1253 A/101331 C 401/
080280033 — CONTROL SYSTEMS

(Common to EEE/ICE/EIE)

(Regulation 2008)

(Common to instrumentation and control Engineering, Electronics and Instrumentation Engineering)

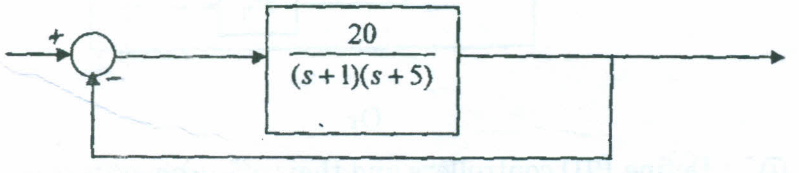
Time : Three hours | Maximum : 100 marks

(Graph sheet, semi log sheet and polar sheet may be permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the type and order of the following systems.
   (a) $G(s)=(s+1)/s^2(s+2)(s+3)$
   (b) $G(s)=s^2(s+1)/(s+2)^2(s+3)(s+5)$
2. What is the difference between AC servo motor and 2 phase induction motor?
3. The block diagram of a unity feedback system is shown in figure below, determine the second undershoot time?




4. Draw the unit step response of second order system for following pole locations
   (a) Pure imaginary
   (b) Complex conjugate near to imaginary axis.

5. Draw the polar plot for the following system $G(s)= 10/s(s+ 1 )(s+2)$

6. Write the correlation of time domain specifications and frequency domain specifications.

7. Define phase margin.

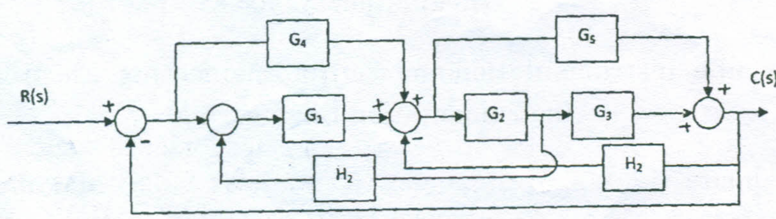
8. Examine the stability of the system whose characteristic equation is $S^5+S^4+2S^3+2s^2\ 3S+15=0$ using Routh Hurwitz criterion.

9. What is the effect of lead compensator on system response?

10. Draw the pole-zero location of a lead compensator.

PART B — (5 × 16 = 80 marks)

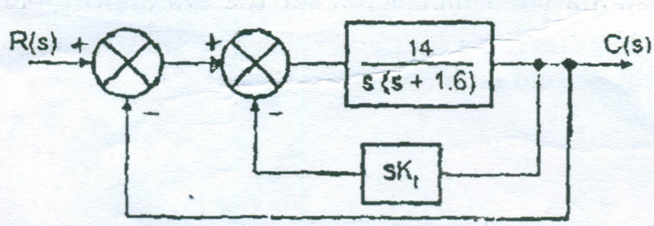
11. (a) Determine the transfer function C(s)/R(s) of the system shown in Figure below by using (i) Block Diagram reduction technique (ii) Mason's gain formula.




Or

(b) Explain the working principle of a synchro and how it works as error detector.

12. (a) The system shown in figure below uses a rate feed back controller. Determine the Tachometer constant Kt so as to obtain the damping ratio as 0.5. Calculate the corresponding $\omega_d$ Tp, $T_s$ and $M_p$.




Or

(b) (i) Define PID controllers and their effect on system performance. (10)

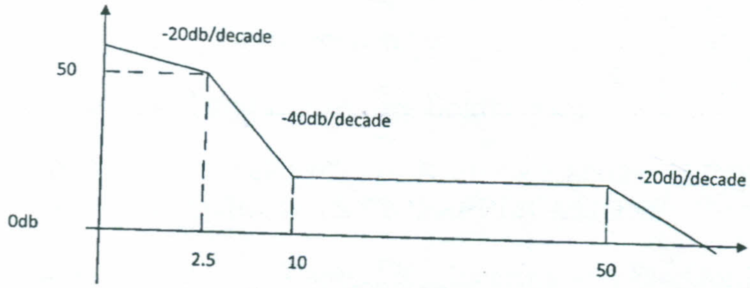
(ii) Determine steady state errors of type 0, type 1, type 2 systems for unit step, unit ramp and unit parabolic inputs. (6)

13. (a) Sketch the Bode Magnitude plot for the transfer function $G(s) = Ks^2/(1+0.2s)(1+0.02s)$

Hence find 'K' such that gain cross over frequency is 5 rad/sec.

Or

(b) Find the transfer function of the system whose experimental frequency response data is given below?(error between actual plot and asymptotic plot at corner frequency 10 is –6db)




14. (a) Draw the root locus of the unity feed back system whose open loop Transfer function is $G(s) = \dfrac{K}{s(s+2)(s^2+6s+25)}$.

Or

(b) By use of Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not. If not, how many closed loop poles lie in the right half S-plane?

$$GH(s) = \frac{4s+1}{s^2(s+1)(2s+1)}$$

15. (a) Explain the frequency response of lead compensator and write steps to design a lead compensator.

Or

(b) Design a lag compensator for the system $G(s)=K/s(s+1)$ to have velocity error constant 10 and phase margin at least 45°.

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