Registration No. : | | | | | | | | | | |

Total number of printed pages – 3

B. Tech

CPEE 5302

Fifth Semester (Special) Examination – 2013

CONTROL SYSTEM ENGINEERING

BRANCH : AEIE, EEE, ELECTRICAL

QUESTION CODE : D 275

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

(a) Discuss the merits and demerits of open loop and closed loop system.

(b) How do you categorize types and orders of a system ?

(c) Write down the rules for shifting a summing point before a block and shifting a take off point after a block.

(d) For a unity feedback system having $G(s) = \frac{64}{s(s+8)}$, find the time at which second undershoots will occur.

(e) What is the significance of breakaway point on the root locus ?

(f) What is the inference regarding system stability when the system characteristic equation has multiple poles on the $j\omega$ - axis in s-plane ?

(g) What is principle of argument ?

(h) Find the damped natural frequency $\frac{d^2c(t)}{dt^2} + 8\frac{dc(t)}{dt} = 64[r(t) - c(t)]$ for a closed loop system represented by differential equation

Where c(t) is the displacement of the output shaft and r(t) is the displacement of input shaft.

P.T.O.

(b) Check the stability of the characteristic equation and find the number of roots of this equation with positive real part, zero real part and negative real part. 5

$S^6 + 4S^5 + 3S^4 - 16S^2 - 64S - 48 = 0$

5. (a) Draw the Bode plot for the transfer function and comment on stability. 5

$$G(s) = \frac{800(s+2)}{s^2(s+10)(s+40)}$$

(b) Briefly explain gain margin, phase margin, phase crossover frequency, gain crossover frequency from Bode plot point of view. 5

6. (a) The open-loop transfer function of a control system is given by 5

$$G(s)H(s) = \frac{5}{S(1+0.5s)}$$

Draw the Nyquist plot and comment on the stability of the closed-loop system.

(b) Explain the effect of regenerative and degenerative feedback on control system. 5

7. (a) Sketch the polar plot for a system with 5

$$G(s)H(s) = \frac{10}{S(s+1)(s+2)}$$

(b) The open loop transfer function of a unity feedback control system is 5

$$G(s) = \frac{K}{S(1+TS)}$$

Determine the values of K and T if it is desired that all the roots of the closed loop system should lie in the region towards the left of the line $s = -a$.

8. Write short notes on any **two** of the following : 5×2

(a) Force-Voltage and Force-current analogy

(b) PID Controllers and their applications to feedback control systems

(c) Synchros.
