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Invigilator's Signature :	

CS/B.Tech/(ICE-NEW)/SEM-4/IC-401/2013 2013 BASIC CONTROL THEORY

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP - A

(Multiple Choice Type Questions)

- 1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) The transfer function of a system is its
 - a) Square response
- b) Step response
- c) Ramp response
- d) Impulse response.
- ii) In a signal flow graph
 - a) nodes represent variables
 - b) branches represent variable
 - c) both of these
 - d) none of these.
- iii) If the maximum overshoot is 100% the damping ratio is
 - a) 0

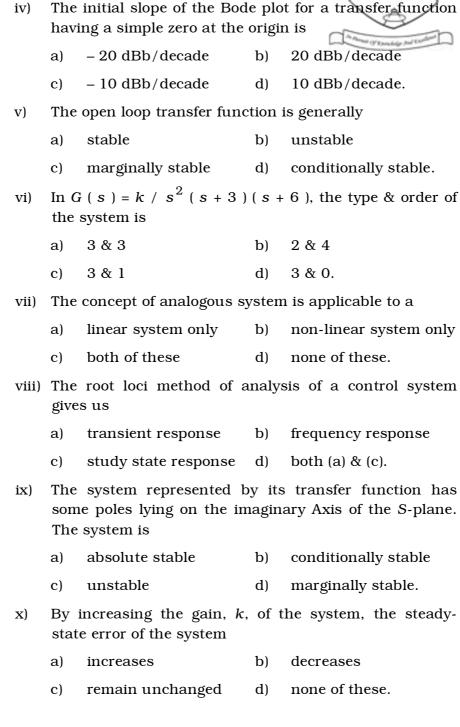
b) 1

c) 2

d) 0.5.

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GROUP - B

(Short Answer Type Questions)

Answer any three of the following.

 $3 \times 5 = 15$

2. The open-loop transfer function of a unity negative feedback system is given below:

$$G(s) = 500 / S(S + 15)$$
. Determine —

- a) the transient response for a unit step input
- b) the value of rise time and peak time.
- 3. Determine the stability of system whose characteristic equation is given by

$$S^5 + 2S^4 + 3S^3 + 6S^2$$

- 4. Draw the polar plot of transfer function G(s) = 5/s(s + 15)(s 7).
- 5. Find the transfer function of armature-controlled *d.c.* motor.
- 6. For the system having G(s) = 25/S(S + 10) and unity feedback, find the following parameters when excited a unit step input.
 - a) Wn
 - b) Wd
 - c) Tp
 - d) Mp
 - e) ζ

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(Long Answer Type Questions)

Answer any three of the following.



- 7. a) State the Nyquist stability criteria.
 - b) Using Nyquist stability criteria, determine whether the unity feedback close-loop system having open-loop transfer function G (S) H (S) = 10 / S (1 + S) (1 + 0.05 S) is stable or not.
 - c) What is relative stability?

3 + 10 + 2

8. a) Sketch the root locus for the system having

$$G(S)H(S) = K(S+1)/(S+3)(S+4)(S+7).$$

- b) What is root contour? What is the difference between root locus and root contour? 10 + 2 + 3
- 9. a) Explain the meaning and significance of phase margin and gain margin of a control system. How will you obtain the values of these margins from Bode plot.
 - b) Sketch the Bode plot for the following function and find out the approximate values of the gain margin & phase margin.

$$G(s) = 10(S+2)/S(S+6)(S+10).$$
 7+8

10. Write short notes on any *three* of the following :

 3×5

- a) Servo motor
- b) PID controller
- c) Absolute stability & Relative stability
- d) Tachometers
- e) Effect of poles and zeros on stability.

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