	Utech
Name :	
Roll No.:	A Description and Explored
Invigilator's Signature :	

CS/B.TECH(ICE-OLD)/SEM-4/IC-401/2012 2012

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)

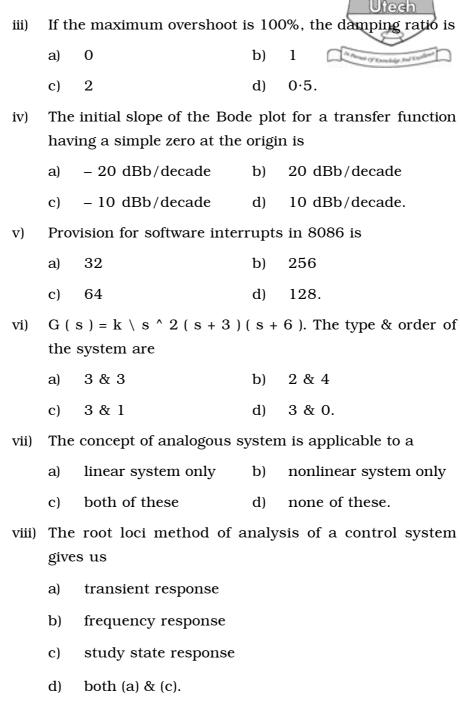
1. Choose the correct alternatives for the following:

 $10 \times 1 = 10$

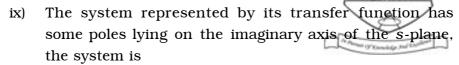
- i) The transfer function of a system is its
 - a) square response
 - b) step response
 - c) ramp response
 - d) impulse response.
- ii) In a signal flow graph
 - a) nodes represent variables
 - b) branches represent variable
 - c) both of these
 - d) none of these.

4119(O) [Turn over

CS/B.TECH(ICE-OLD)/SEM-4/IC-401/2012



CS/B.TECH(ICE-OLD)/SEM-4/IC-401



- a) absolute stable
- b) conditionally stable
- c) unstable
- d) marginally stable.
- x) By increasing the gain, k of the system, the steadystate error of the system
 - a) increases
- b) decreases
- c) remains unchanged
- d) none of these.

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) =
$$500 \setminus S$$
 ($S + 15$).

- 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

$$S ^5 + 2S ^4 + 3S ^3 + 6S ^2 + 5S + 3 = 0.$$

4. Draw the polar plot of transfer function :

$$G(s) = 5 \setminus S(S + 15)(S - 7).$$

- 5. Find the transfer function of armature-controlled dc motor.
- 6. For the system having $G(s) = 25\S(S + 10)$ and feedback, find the following parameters when excited a unit step input.
 - a) Wn
 - b) Wd
 - c) Tp
 - d) Mp
 - e) ζ.

CS/B.TECH(ICE-OLD)/SEM-4/IC-401/2012

GROUP - C

(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 + 0.05S) is stable or not.

c) What is relative stability?

3 + 10 + 2

- 8. a) Sketch the root locus for the system having $G(S)H(S) = K\setminus (S^3 + S^2 + S^3)$.
 - b) A unity feedback control system has open loop transfer function G (S) H (S) = $10\$ (1 + S) (1 + 0.05 S). Find the range of values of K so that the close-loop system is stable. 8 + 7
- 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:

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

10. Write the short notes on any three:

5 + 5 + 5

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

4