NAME: _____ **ROLL #:** _____

ChE381A Process Dynamics & Control **Jan-Apr 2014**

Quiz 2 Paper **A** **30 minutes; 18 points**

• 3 points for a correct answer. *Negative marking*: Two points will be deducted per wrong answer.

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1. For a first-order lead system with transfer function $g(s) = K(\zeta s + 1)$, the corner frequency is given by
(a) $1/\zeta$ (b) π/ζ (c) $2\pi/\zeta$ (d) $2/\zeta$

2. Which of the following statements are **TRUE** for a PI controller ?

I When K_c is constant, and as τ_I decreases, the response becomes faster, but more oscillatory.

II The order of the system with PI feedback remains the same.

III As K_c increases, the response becomes faster and more oscillatory to set point changes.

IV Offset is eliminated with PI control.

(a) IV, III, and II (b) I, III, and IV (c) I and IV (d) III and IV

3. If the process transfer function $G_p(s) = 10/(s-1)$, $G_v = 1$, $G_m = 1$, and $G_c = K_c$, the closed-loop system is *stable* when
(a) $K_c > 10$ (b) $K_c < 10$ (c) $K_c < 1/10$ (d) $K_c > 1/10$

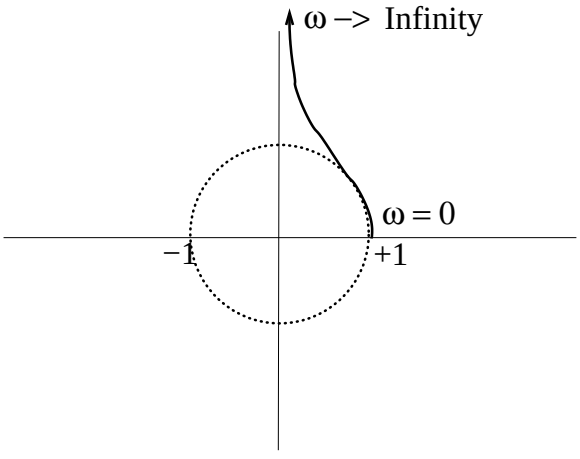

Figure 1: **Nyquist plot for problem 4**

4. The Nyquist plot qualitatively sketched in figure 1 corresponds to:
(a) P controller (b) PI controller (c) PD controller (d) PID controller

5. A stable system under feedback control should have
(a) GM < 1, PM > 0 (b) GM > 1, PM > 0 (c) GM < 1, PM < 0
(d) GM > 1, PM < 0

6. For a process with transfer function $G_p(s) = 5/(2s+1)$, and with proportional (only) control (with $G_m = 1$, $G_v = 1$, and $G_c = K_c = 2$), the steady-state offset under feedback control to unit step change in the set point is:
(a) 10/11 (b) 20/11 (c) 1/11 (d) 2/11