NAME: SOLUTION KEY **ROLL #:** _____

ChE381A Process Dynamics & Control **Jan-Apr 2015**

Quiz 1 Paper **B** **30 minutes; 14 points**

• 2 marks for a correct answer. *Negative marking*: One point will be deducted per wrong answer.

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1. The second-order system given by

$$G(s) = \frac{8}{16s^2 + 16s + 2}$$

is:
(a) critically damped (b) under-damped (c) over-damped (d) unstable

2. The poles and zeros of the transfer function

$$G(s) = \frac{s-5}{(s+4)(s^2+9)}$$

are respectively:
(a) 3, -3, 4, 5 (b) $3j$, $-3j$, -4, 5 (c) $3j$, $-3j$, -4, -5 (d) 3, -3, -4, -5

3. A first-order system with process gain 4 and time constant 3 (arbitrary time units) is subjected to an impulse input of strength 6 at $t = 0$. The value of the output response at time $t = 0^+$ is:
(a) 4 (b) 3 (c) 6 (d) 8

4. A unit-step input is given to a process described by the transfer function $(4s-2)/(s^2+3s+2)$. The initial value (at $t = 0^+$) of the derivative of the output variable in response to the step input is:
(a) -2 (b) 0 (c) 4 (d) 2

5. The ultimate steady-state response of the system with

$$G(s) = \frac{8(4s+2)}{(3s^2+2s+8)}$$

to step input of magnitude 4 is:
(a) 8 (b) 2 (c) 4 (d) 16

6. The inverse Laplace transform of the function $f(s) = \frac{s+6}{s(1-s)}$ is:
(a) $7 - 6\exp[t]$ (b) $6 - 7\exp[t]$ (c) $6 - 7\exp[-t]$ (d) $7 - 6\exp[-t]$

7. The steady-state gain of a process described by the transfer function (given below) is:

$$G(s) = \frac{(5s+6)}{(8s^2+6s+3)}$$

(a) 2 (b) 6 (c) 5/8 (d) 0