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

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

Quiz 1 Paper **A** **30 minutes; 16 points**

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

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

$$G(s) = \frac{3(s+2)}{(s^2+2s+10)}$$

to a unit step input is
(a) 0 (b) ∞ (c) 0.6 (d) 3

2. The inverse Laplace transform of the function $f(s) = \frac{1}{s(1+2s)}$ is:
(a) $-1+\exp[t/2]$ (b) $1-\exp[-t/2]$ (c) $1-\exp[2t]$ (d) $1-\exp[t/2]$

3. The poles of the transfer function

$$G(s) = \frac{1}{s(s^2+9)}$$

are
(a) $\infty, -3, 3$ (b) $0, -3j, 3j$ (c) $0, 3, -3j$ (d) $0, -3, 3$

4. The ultimate steady-state response of a first-order system (steady-state gain K and time constant τ) to a rectangular pulse input (of height h and time t_w) is
(a) 1 (b) Kt_wh (c) 0 (d) K

5. The unit impulse response of a first-order process is $5\exp[-t/4]$. The gain and time constant of the process are, respectively:
(a) 5 and 4 (b) 10 and 4 (c) 5 and 0.25 (d) 20 and 4

6. A unit-step input is given to a process that is described by the transfer function $(s-8)/(s+2)$. The initial value (at $t = 0^+$) of the response of the process to the step-input is:
(a) 1 (b) 4 (c) -4 (d) -1

7. The inverse Laplace transform of the following function of s is:

$$\frac{1+3s}{2s^2+s}$$

(a) $1+\exp[-t/2]/2$ (b) $1-\exp[t/2]/2$ (c) $1+\exp[-2t]/2$ (d) $1-\exp[-2t]/2$

8. The inverse Laplace transform of $\exp[-5s]/(s+1)$ is given by (with $\Theta(t)$ being the unit step function):

(a) $\exp[5-t]\Theta[t]$ (b) $\exp[t-5]\Theta[t-5]$ (c) $\exp[5-t]\Theta[t-5]$ (d) $\exp[5-t]\Theta[t]$