Monday, July 6, 2015  
Allowed Time: 1 Hours

Instructions:
1. Write neatly and legibly. You may lose points for messy work.

2. Show all your work. No points for answers without justification.

3. Calculators and Mobiles are not allowed.

4. Make sure that you have 3 different problems (3 pages + cover page).

<table>
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<th>Problem No.</th>
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Q1. Use the **Stokes' theorem** to evaluate $\oint_C y \, dx + 2x \, dy + z \, dz$, where $C$ is the curve of intersection of the cylinder $x^2 + y^2 = 1$ with the upper half sphere $x^2 + y^2 + z^2 = 4$. Orient $C$ counterclockwise as viewed from above.

(note: If you don't use **Stokes' theorem**, you will get zero)
Q2. Let $D$ be the region lying inside the cylinder $x^2 + y^2 = 1$ bounded by the two planes $z = 0$ and $z = 2 - y$. Use the divergence theorem to find the outward flux $\iint_S (F \cdot n) \, dS$ of the vector field $F = z \mathbf{k}$, where $S$ is the boundary of $D$. 
Q3. Use the Laplace transform to solve the integrodifferential equation

\[ y'' + y + \int_0^t y(\tau) \sinh(t - \tau) \, d\tau = \delta(t - 1), \quad y(0) = 1, \quad y'(0) = 0. \]
Preview Test: Exam2

Test Information
Description: Respondus
Instructions:
Timed Test: This test has a time limit of 1 hour. This test will save and submit automatically when the time expires. Warnings appear when half the time, 5 minutes, 1 minute, and 30 seconds remain. [The timer does not appear when previewing this test]
Multiple Attempts: Not allowed. This test can only be taken once.

Question Completion Status:
1 2 3 4 5 6 7 8 9 10 11

QUESTION 1
Let \( G(t) = \mathcal{L}\{g(t)\} \)
where \( g(t) = 4t \cosh(6t) \)
then \( G(1) = \)

QUESTION 2
Let \( G(t) = \mathcal{L}\{g(t)\} \)
where \( g(t) = 5t^3 + 2 \)
then \( G(1/2) = \)

QUESTION 3
Let \( F(s) \) be the Laplace transform of \( f(t) = 100e^{-9t} \cos(7t) \)
then \( F(0) = \)
QUESTION 4

The piecewise function
\[ f(t) = \begin{cases} 
  a & 0 \leq t < 5 \\
  b & 5 \leq t < 9 \\
  0 & t \geq 9 
\end{cases} \]

can be written in terms of step functions as
\[ f(t) = \alpha - \beta \mathcal{U}(t-5) + \gamma \mathcal{U}(t-9) \]
if \( a = 8 \), \( b = 9 \), then \( \alpha - \beta + \gamma = \)

QUESTION 5

Let \( f(t) = \mathcal{L}^{-1} \left( \frac{se^{-s\alpha}}{s^2 + b^2} \right) \)

if \( a = 4 \) and \( b = 12 \) then \( f \left( \frac{45\pi}{4} \right) = \)

QUESTION 6

Let \( F(t) = \mathcal{L} \{ f(t) \} \)
where \( f(t) \) is the given periodic function

\[ f(t) = \begin{cases} 
  1 & \text{if } a \leq t < 2a \\
  0 & \text{otherwise} 
\end{cases} \]

if \( a = 7 \) then \( F(1) = \)

QUESTION 7

Let \( G(t) = \mathcal{L} \{ g(t) \} \)
where \( g(t) = 10000 \sin(6t - 3\pi) \)
then \( G(1) = \)
QUESTION 8
Let \( G(s) = \mathcal{L}\{ 19 t^{3/2} \} \)
then \( G(\frac{19}{s}) = \)

QUESTION 9
Let \( G(s) = \mathcal{L}\{g(t)\} \)
where \( g(t) = e^{5t} \ast \sinh(5t) \)
then \( G(1) = \)

\{note that \( \ast \) is the convolution symbol\}

QUESTION 10
Let \( G(s) = \mathcal{L}\{g(t)\} \)
where \( g(t) = 3e^{-3t} + 6e^{6t} \)
then \( G(2) = \)

QUESTION 11
Let \( F(s) = \mathcal{L}\{3 \delta(t-2)\} \)
then \( F(1) = \)

Click Save and Submit to save and submit. Click Save All Answers to save all answers.