THIS EXAM IS CLOSED TO BOOKS AND NOTES. NO CALCULATORS ARE ALLOWED!
Use the back of the **previous** page if more space is needed!

MA303   EXAMINATION II (Practice)

Name_____ ID #_____ Section #_____

There are 11 Problems on this booklet. For All problems, mark the answers clearly.

Points awarded

1. (5 pts) _____

2. (5 pts) _____

3. (5 pts) _____

4. (5 pts) _____

5. (5 pts) _____

6. (5 pts) _____

7. (5 pts) _____

8. (5 pts) _____

9. (5 pts) _____

10. (5 pts) _____

Total Points: _____

1. (5 points)

$$f(t) = 1 + u_2(t)(t-2) + u_4(t)(2-t) + u_6(t)t^2$$

The values of $f(3)$, $f(5)$ and $f(7)$ are

    a) 10,   26,   50.

    b) 1, -3,   49.

    c) 2,   1,   49.

    d) 2, -3,   50.

    e) 2,   1,   50.

2. (5 points) Let s be a constant. Compute

$$\int_2^4 5e^{-st}\,dt$$

    a) $-5(e^{-4s} - e^{-2s})$

    b) $-\dfrac{5}{s}(e^{-4s} - e^{-2s})$

    c) $5(e^{-4t} - e^{-2t})$

    d) $\dfrac{5}{s}(e^{-4s} - e^{-2s})$

    e) $10s$

3. (5 points) Compute

$$\int_0^t (t - \tau)\tau \; d\tau =$$

    a) 0

    b) $\dfrac{1}{2}t^2$

    c) $\dfrac{1}{6}t^3$

    d) $-\dfrac{1}{2}\tau^3$

    e) $\dfrac{1}{2}(t - \tau)^3$

4. (5 points)

$$f(t) = \int_0^t (t - \tau)^3 \cos(3\tau)d\tau$$

Find the Laplace transform of $f(t)$.

    a) $\dfrac{6s}{s^4(s^2 + 9)}$

    b) $\dfrac{18s}{s^4(s^2 + 9)}$

    c) $\dfrac{6}{s^4} + \dfrac{3s}{s^2 + 9}$

    d) $\dfrac{6}{s^4(s^2 + 9)}$

    e) $\dfrac{s}{s^4(s^2 + 9)}$

5. (5 points) What is the solution of initial value problem

$$y'' = \delta(t - \pi) - \delta(t - 2\pi); \qquad y(0) = y'(0) = 0.$$

    a) $y(t) = u_\pi(t)t - u_{2\pi} + \pi$

    b) $y(t) = \dfrac{1}{t^2}(e^{-\pi t} - e^{-2\pi t})$

    c) $y(t) = c_1 + c_2 t$

    d) $y(t) = u_\pi(t)\,(t - \pi) - u_{2\pi}(t)\,(t - 2\pi)$

    e) $y(t) = u_\pi(t)t - u_{2\pi}t$

6. (5 points) The inverse Laplace transform of

$$F(s) = \frac{se^{-2s}}{s^2 + 4s + 13}$$

is

    a) $u_2(t)(e^{-2t}\cos(3(t - 2)) - e^{-2t}\sin(3(t - 2)))$

    b) $u_2(t)(e^{-2(t-2)}\cos(3(t - 2)) - \dfrac{2}{3}e^{-2(t-2)}\sin(3(t - 2)))$

    c) $u_2(t)(e^{-2t}\cos(3t) - \dfrac{2}{3}e^{-2t}\sin(3t))$

    d) $u_2(t)(e^{-2(t+2)}\cos(3(t + 2)) - \dfrac{2}{3}e^{-2(t+2)}\sin(3(t + 2)))$

    e) $e^{-2(t+2)}\cos(3(t + 2)) - \dfrac{2}{3}e^{-2(t+2)}\sin(3(t + 2)))$

7. (5 points)

$$f(t) = \begin{cases} t, & 0 \le t < 4 \\ t^2 + t, & 4 \le t < \infty. \end{cases}$$

Find the Laplace transform of $f(t)$.

a) $F(s) = \dfrac{2}{s^3}$

b) $F(s) = \dfrac{1}{s^2} + e^{-4s}\left(\dfrac{2}{s^3} - \dfrac{1}{s^2}\right)$

c) $F(s) = \dfrac{1}{s^2} + e^{-4s}\left(\dfrac{1}{s} - \dfrac{1}{s^2}\right)$

d) $F(s) = \dfrac{1}{s^2} + e^{-4s}\left(\dfrac{2}{s^3} + \dfrac{8}{s^2} + \dfrac{16}{s}\right)$

e) $F(s) = \dfrac{1}{s^2} + e^{-4s}\left(\dfrac{2}{s^3} - \dfrac{8}{s^2} + \dfrac{16}{s}\right)$

8. (5 points) Find the Laplace transform of

$$f(t) = t\cos(2t)$$

.

a) $F(s) = \dfrac{4 - s^2}{(s^2 + 4)^2}$

b) $F(s) = e^{-s}\dfrac{s}{s^2 + 4}$

c) $F(s) = \dfrac{s - 1}{(s - 1)^2 + 4}$

d) $F(s) = \dfrac{1}{s(s^2 + 4)}$

e) $F(s) = \dfrac{s^2 - 4}{(s^2 + 4)^2}$

9. (5 points) Solve the initial value problem

$$y'' + y = f(t); \quad y(0) = 0, \quad y'(0) = 1$$

where

$$f(t) = \begin{cases} 0 & t < 2 \\ 3 & 2 \le t \end{cases}$$

a) $y(t) = \sin(t) + 3(t-2)u_2(t) - 3u_2(t)\cos(t-2)$

b) $y(t) = c_1 \cos(t) + c_2 \sin(t)$

c) $y(t) = \sin(t) + 3u_2(t) + 3u_2(t)\sin(t)$

d) $y(t) = \sin(t) + 3u_2(t) + 3u_2(t)\sin(t-2)$

e) $y(t) = \sin(t) + 3u_2(t) - 3u_2(t)\cos(t-2)$

10. (5 points) What is the solution of initial value problem

$$y'' + 2y' + 2y = \delta(t - \pi); \quad y(0) = 1, \quad y'(0) = 0.$$

a) $y(t) = e^{-t}\cos(t) + e^{-t}\sin(t) + u_\pi(t)e^{\pi-t}\sin(t-\pi)$

b) $y(t) = e^{-t}\cos(t) + 2e^{-t}\sin(t) + u_\pi(t)e^{\pi-t}\sin(t-\pi)$

c) $y(t) = u_\pi(t)e^{t-\pi}\sin(t-\pi)$

d) $y(t) = e^{-t}\cos(t) + 2e^{-t}\sin(t) + u_\pi(t)e^{\pi-t}\sin(t-\pi) + u_\pi(t)e^{\pi-t}\cos(t-\pi)$

e) $y(t) = e^{-t}\cos(t) + e^{-t}\sin(t) + u_\pi(t)e^{\pi-t}\cos(t-\pi)$

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EXAMINATION II (Practice) (Answer)

1. E
2. B
3. C
4. A
5. D
6. B
7. D
8. E
9. E
10. A