

Department of Electrical & Computer Engineering
Prairie View A&M University
Ph.D. Preliminary Examination
in
Engineering Mathematics
Fall, 2014

Write legibly.

No points will be given for answers that show no work.

Do not use cell phone during the examination.
(Calculator will be provided upon request.)

Note: Each problem is worth 20 points.

Name: _____ Date: _____

1. Solve the following initial value problem:

$$y'' + y' + 0.25y = 0, \quad y(0) = 3, \quad y'(0) = -3.5$$

2. Use Laplace transform to solve the following integrodifferential equation:

$$\frac{dy}{dx} + 4y + 3 \int_0^t y dt = 6e^{-2t}, \quad y(0) = -1$$

3. Determine whether the random variables X and Y are independent when their joint PDF is given by

$$f_{XY}(x, y) = \begin{cases} 2e^{-(x+y)} & 0 \leq x \leq y, \quad 0 \leq y < \infty \\ 0 & \text{otherwise} \end{cases}$$

4. Assume that the random variable S_n is the sum of 100 independent experimental values of the random variable X whose PDF is given by

$$f_X(x) = \begin{cases} \frac{1}{3} & 1 \leq x \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

Find the probability that S_n lies in the range $230 \leq S_n \leq 260$.

5. Find the area of the region bounded by the curves $y = \sin x$, $y = \cos x$, $x = 0$, and $x = \pi / 2$.

