Department of Electrical & Computer Engineering
Prairie View A&M University
Ph.D. Preliminary Examination
in
Engineering Mathematics
Fall, 2017

**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: _November 3, 2017

1. Given that $F(s) = \dfrac{se^{-s}}{(s+3)(s+4)}$, find f(t).

2. *Find the Fourier series for* $x(t) = \begin{cases} 5, & 0 < t < \pi \\ 10, & \pi < t < 2\pi \end{cases}$ where $x(t + 2\pi) = x(t)$.

3. *Given* $y''+3y'-4y=2e^{x}$, $y(0)=1$, $y'(0)=2$, *solve for* $y(x)$.

4. Diagonalize the following matrix, if possible.

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$$

5. Customers who purchase a certain make of car can order an engine in any of three sizes. Of all cars sold, 45% have the smallest engine, 35% have the medium-sized one, and 20% have the largest. Of cars with the smallest engine, 10% fails an emissions test within two years of purchase, while 12% of those with the medium size and 15% of those with the largest engine.

(a) What is the probability that a randomly chosen car will fail an emissions test within two years?

(b) A record for a failed emissions test is chosen at random. What is the probability that it is for a car with a small engine?