ECEN4503 Quiz #3 3 February 2012 Name Solution

1) A PC manufacturer buys power supplies from 2 different companies (A & B). 60% of the power supplies come from company A, 40% from B. Assembly line workers install these in PC's at random, in these same proportions (60% from A, 40% from B). Customer claims, under the PC's one year warranty, indicate 4% of all installed power supplies fail within one year. Records indicate 55% of the failed power supplies are from company A, and 45% are from company B.

[4] **Compute** P(a randomly chose power supply from company A will fail in the first year).

Suppose you had 1000 Power Supplies

$$\frac{22 \text{ bad from A}}{600 \text{ total from A}} = .03667 \quad \text{ANS}$$

2) A random voltage X has PDF $f_X(x) = \alpha x;\ 0 \le x \le \alpha$ volts.

[2] **Compute** the value for α.

[2] **Compute** the expected value E[X], the D.C. voltage of X.

[2] **Compute** standard deviation σ_X, the A.C. rms voltage of X.

$$\int_0^\alpha \alpha x\,dx \overset{\text{must}}{=} 1 \Rightarrow \alpha \frac{x^2}{2}\Big|_0^\alpha = \frac{\alpha^3}{2} \overset{\text{set}}{=} 1$$

$$= \alpha = \sqrt[3]{2} = 1.260 \quad \text{ANS}$$

$$E[X] = \int_0^\alpha x \cdot \alpha x\,dx = \int_0^\alpha \alpha x^2 dx = \frac{\alpha x^3}{3}\Big|_0^\alpha = \frac{\alpha^4}{3} = .8402 \text{ V}$$

ANS

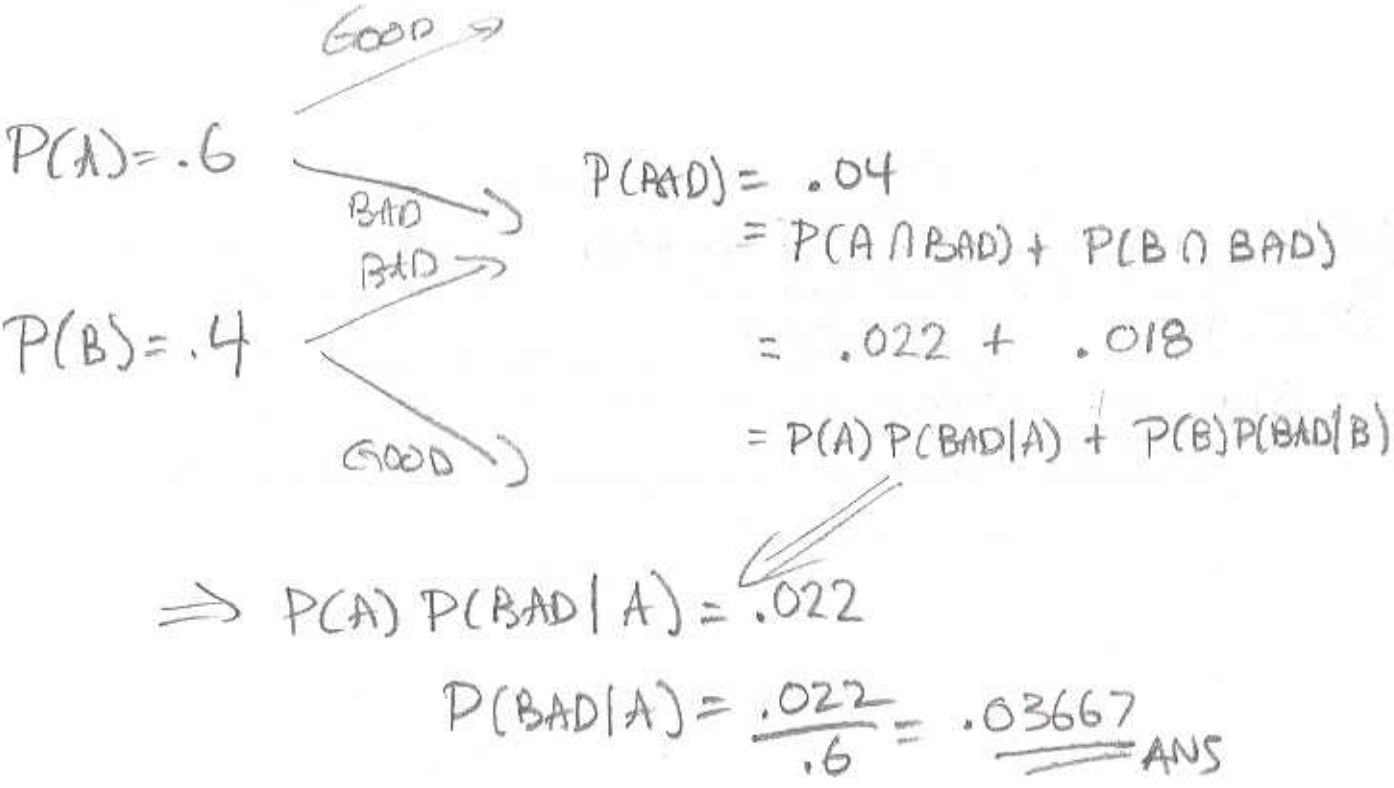
$$E[X^2] = \int_0^\alpha x^2 \cdot \alpha x\,dx = \int_0^\alpha \alpha x^3 dx = \frac{\alpha x^4}{4}\Big|_0^\alpha = \frac{\alpha^5}{4} = .7939 \text{ W}$$

$$\sigma_x^2 = E[X^2] - E[X]^2 = .7939 - .8402^2 = 0.08801$$

$$\Rightarrow \sigma_x = .2967 \text{ V}_{\text{rms}}$$

ANS

1)



$\Rightarrow P(A)\,P(BAD \mid A) = .022$

$P(BAD \mid A) = \frac{.022}{.6} = .03667$ ANS