

# Exam P

## Problem 98 (Univariate Probability Dist'n)

$$M_Y(t) \quad Y = X_1 X_2 X_3.$$

$$\begin{aligned} M_Y(t) &= E(e^{Yt}) \\ &= E(e^{X_1 X_2 X_3 t}) \\ &\neq (M_{X_i}(t))^3 \end{aligned}$$

$$Y = X_1 \cdot X_2 \cdot X_3.$$

Y can only be 0 or 1

$$Pr(X_i) = \begin{cases} 1/3 & X=0 \\ 2/3 & X=1 \\ 0 & \text{o.w.} \end{cases}$$

$$Pr(Y) = \begin{cases} 19/27 & Y=0 \\ 8/27 & Y=1 \\ 0 & \text{o.w.} \end{cases}$$

$$\begin{aligned} Pr(Y=1) &= Pr(X_1=1) \cdot Pr(X_2=1) \cdot Pr(X_3=1) \\ &= (2/3)^3 = 8/27 \end{aligned}$$

$$Pr(Y=0) = 1 - 8/27 = 19/27.$$

$$\begin{aligned} E(e^{Yt}) &= \sum e^{Y_i t} \cdot Pr(Y=Y_i) \\ &= e^{0 \cdot t} \cdot Pr(Y=0) + e^{1 \cdot t} \cdot Pr(Y=1) \\ &= 19/27 + 8/27 \cdot e^t \end{aligned}$$

choose A.