Q2.2

$$E(S|\lambda) = E(N|\lambda) \cdot E(X|\lambda) \overset{X \perp \lambda}{=} \underbrace{E(N|\lambda)}_{=\lambda} \cdot E(X) = \lambda \times 4 = 4\lambda$$

(λ: fixed)

$E(S)$ $\lambda \to$ Poisson parameter N $X \sim \exp(\alpha)$

Assume $X \perp N$ ($N \to \lambda$)

$E(X) = \frac{1}{\alpha} = 4$

$\mathrm{Var}(X) = \frac{1}{\alpha^2} = 16$

~~Var (S~~

$$\mathrm{Var}(S|\lambda) = E(N|\lambda) \cdot \mathrm{Var}(X|\lambda) + \mathrm{Var}(N|\lambda) \left[E(X|\lambda)\right]^2$$

$$\overset{X \perp \lambda}{=} E(N|\lambda) \cdot \mathrm{Var}(X) + \mathrm{Var}(N|\lambda) \cdot \left[E(X)\right]^2$$

$$= \lambda \times 16 + \lambda \times 4^2 = 32\lambda$$

Q2.3 $E(S) = E(E(S|\lambda))$

$= E(4\lambda)$

$= 4E(\lambda) = 4 \times (20\% \times 2 + 60\% \times 3 + 20\% \times 4)$

$= 12$

Final exam tip: ~~Exa~~ Earlier Qs might be the hint / tool to be used in Later Qs

T W3 ①

Q2.4 $\text{Var}(S) = \text{Var}\left[E(S|\lambda)\right] + E\left[\text{Var}(S|\lambda)\right]$

Q2.2 $= \text{Var}(4\lambda) + E(32\lambda)$

$= 16\,\text{Var}(\lambda) + 32\,E(\lambda)$

$= 16 \times 0.4 + 32 \times 3$

$= 102.4$

$\text{Var}(\lambda) = E(\lambda^2) - \left(E(\lambda)\right)^2$

$E(\lambda^2) = 20\% \times 2^2 + \ldots$

Q3.(iv) Week 2 Slide 24 MLE for censored data

$$L(\underline{\theta}) = \prod_{1}^{n} f(x_i; \theta) \times \left[1 - F(M; \theta)\right]^m$$

f: PDF; F: CDF

L of 987 claims $\lambda^n \times \exp\left(-\lambda \cdot \sum_{i=1}^{987} x_i\right)$

PDF of X: $f(x) = \lambda \cdot e^{-\lambda x}$

L of 13 claims $\left[P(x > M)\right]^{13} = \exp\left(-\lambda \cdot M \cdot 13\right)$

TW3 (2)