Solution # 167

(50) employment subject to double decrement

(i) Retirement $\mu^{(1)}_{50+t} = \begin{cases} 0 & 0 \le t < 5 \\ .02 & 5 \le t \end{cases}$

(ii) All other causes $\mu^{(2)}_{50+t} = \begin{cases} .05 & 0 \le t < 5 \\ .03 & 5 \le t \end{cases}$

Calculate P((50) will retire before age 60)

-OR- ${}_{10}q^{(1)}_{50}$ ${}_{10}q^{(1)}_{50} = \int_0^{10} {}_tp^{(\tau)}_{50}\, \mu^{(1)}_{50+t}\, dt$

$= \int_0^5 {}_tp^{(\tau)}_{50}\, \mu^{(1)}_{50+t}\, dt + {}_5p^{(\tau)}_{50} \int_0^5 {}_tp^{(\tau)}_{55}\, \mu^{(1)}_{55+t}\, dt$

$\mu^{(1)}_{50+t} = 0 \quad 0 < t < 5$

$= {}_5p^{(2)}_{50} \int_0^5 {}_tp^{(\tau)}_{55}\, \mu^{(1)}_{55+t}\, dt = e^{-.05(5)} \int_0^5 e^{-(.02+.03)t}(.02)\, dt$

$= .7788 \left(\frac{.02}{.05}\right)\left[-e^{-.05t}\Big|_0^5\right]$

$= .3115\left(1 - e^{-.25}\right)$

$= .3115(.2212) = .0689$

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