Question #27
Answer: B

$$P_{40} = A_{40} / \ddot{a}_{40} = 0.16132/14.8166 = 0.0108878$$

$$P_{42} = A_{42} / \ddot{a}_{42} = 0.17636/14.5510 = 0.0121201$$

$$a_{45} = \ddot{a}_{45} - 1 = 13.1121$$

$$\begin{aligned} E\left[{}_3L \middle| K_{42} \geq 3\right] &= 1000A_{45} - 1000P_{40} - 1000P_{42}\, a_{45} \\ &= 201.20 - 10.89 - (12.12)(13.1121) \\ &= 31.39 \end{aligned}$$

Many similar formulas would work equally well. One possibility would be ${}_{1000}{}_3V_{42} + (1000P_{42} - 1000P_{40})$, because prospectively after duration 3, this differs from the normal benefit reserve in that in the next year you collect $1000P_{40}$ instead of $1000P_{42}$.

Question #28
Answer: E

$$E\left[\min(T, 40)\right] = 40 - 0.005(40)^2 = 32$$

$$\begin{aligned} 32 &= \int_0^{40} t f(t)\, dt + \int_{40}^{w} 40 f(t)\, dt \\ &= \int_0^{w} t f(t)\, dt - \int_{40}^{w} t f(t)\, dt + 40(.6) \\ &= 86 - \int_{40}^{w} t f(t)\, dt \end{aligned}$$

$$\int_{40}^{w} t f(t) dt = 54$$

$$\mathring{e}_{40} = \frac{\int_{40}^{w} (t-40) f(t)\, dt}{s(40)} = \frac{54 - 40(.6)}{.6} = 50$$