Question #20
Answer: D

$$\mu_x^{(\tau)} = \mu_{x+t}^{(1)} + \mu_{x+t}^{(2)}$$

$$= 0.2\mu_{x+t}^{(\tau)} + \mu_{x+t}^{(2)}$$

$$\Rightarrow \mu_{x+t}^{(2)} = 0.8\mu_{x+t}^{(\tau)}$$

$$q_x^{'(1)} = 1 - p_x^{'(1)} = 1 - e^{-\int_0^1 0.2k\, t^2\, dt} = 1 - e^{-0.2\frac{k}{3}} = 0.04$$

$$k/3 \Rightarrow \ln(1-0.04)/(-0.2) = 0.2041$$
$$k = 0.6123$$

$${}_2q_x^{(2)} = \int_0^2 {}_t p_x^{(\tau)} \mu_x^{(2)}\; dt = 0.8\int_0^2 {}_t p_x^{(\tau)}\;\; \mu_x^{(\tau)}(t)\;\; dt$$

$$= 0.8\; {}_2q_x^{(\tau)} = 0.8\left(1 - {}_2p_x^{(\tau)}\right)$$

$${}_2p_x^{(\tau)} = e^{-\int_0^2 \mu_x(t)dt}$$

$$= e^{-\int_0^2 kt^2\, dt}$$

$$= e^{\frac{-8k}{3}}$$

$$= e^{\frac{-(8)\,(0.6123)}{3}}$$

$$= 0.19538$$

$${}_2q_x^{(2)} = 0.8(1 - 0.19538) = 0.644$$