MAP 4175 / 5177 Name: _____

Exams 1 and 2 Date: September 14, 2016

Show all work for full credit, and use correct notation.

1. Given $p_{35} = 0.98$, determine q_{35}.

$q_{35} = 1 - p_{35} = .02$

2. Given ${}_{35}q_{35} = 0.46$ and ${}_{20}p_{50} = 0.6$, determine ${}_{15}q_{35}$.

${}_{35}p_{35} = {}_{15}p_{35} \cdot {}_{20}p_{50}$

$\Rightarrow .54 = {}_{15}p_{35} \cdot (.6) \Rightarrow {}_{15}p_{35} = .9 \Rightarrow {}_{15}q_{35} = .1$

3. Given ${}_xp_0 = \left(\frac{100-x}{100}\right)^{0.5}$, $0 \le x \le 100$, determine ${}_{28}p_{36}$.

${}_{64}p_0 = {}_{36}p_0 \cdot {}_{28}p_{36}$ ${}_{64}p_0 = .6$ and ${}_{36}p_0 = .8$

$\Rightarrow .6 = .8({}_{28}p_{36}) \Rightarrow {}_{28}p_{36} = \frac{6}{8} = .75$

4. Given

x	q_x	p_x
80	0.3	.7
81	0.4	.6
82	0.5	.5

determine ${}_3q_{80}$.

${}_3q_{80} = 1 - {}_3p_{80} = 1 - p_{80} \cdot p_{81} \cdot p_{82} = 1 - .7(.6)(.5) = .79$

5. Given ${}_{10|20}q_{30} = 0.2$ and ${}_{10}q_{30} = 0.15$, determine ${}_{30}p_{30}$.

${}_{30}q_{30} = {}_{10}q_{30} + {}_{10|20}q_{30} = .15 + .2 = .35$

$\therefore {}_{30}p_{30} = .65$

6. Given ${}_{k|}q_{40} = 0.02(k+1)$ for $k = 0,1,2,\ldots,49$, determine ${}_{5}p_{40}$.

$${}_5q_{40} = q_{40} + {}_1|q_{40} + {}_2|q_{40} + {}_3|q_{40} + {}_4|q_{40}$$
$$= .02 + .04 + .06 + .08 + .1 = .3$$
$$\therefore \quad {}_5p_{40} = .7$$

7. Given ${}_{15|20}q_{25} = 0.18$ and ${}_{15}q_{25} = 0.1$, determine $\int_{20}^{\infty} f_{40}(t)dt$.

$$\int_{20}^{\infty} f_{40}(t)dt = {}_{20}p_{40}$$
$${}_{15|20}q_{25} = {}_{15}p_{25} \cdot {}_{20}q_{40}$$
$$.18 = .9\,({}_{20}q_{40}) \Rightarrow {}_{20}q_{40} = .2$$
$$\therefore {}_{20}p_{40} = .8$$

8. Given $q_{70+k} = 0.1(k+1)$ for $k = 0,1,2,\ldots,9$, determine ${}_{3}q_{70}$.

$$q_{70} = .1$$
$$q_{71} = .2$$
$$q_{72} = .3$$

$${}_3q_{70} = 1 - {}_3p_{70} = 1 - p_{70} \cdot p_{71} \cdot p_{72}$$
$$= 1 - .9(.8)(.7) = .496$$

9. Given ${}_tp_x = e^{-0.04t}$, determine $\mathring{e}_x$.

$$\mathring{e}_x = \int_0^{\infty} {}_tp_x\,dt = \int_0^{\infty} e^{-.04t}\,dt = \frac{1}{.04} = 25$$

10. Given $e_{44} = 32.5$, $p_{44} = \frac{65}{66}$, and $p_{45} = \frac{64}{65}$, determine e_{46}.

$$e_{44} = p_{44} + {}_2p_{44}\,(1 + e_{46}) \qquad {}_2p_{44} = p_{44} \cdot p_{45} = \frac{64}{66}$$

$$32.5 = \frac{65}{66} + \frac{64}{66}\,(1 + e_{46})$$

$$\Rightarrow e_{46} = 31.5$$