MATH 4750 Life Contingencies
Quiz #3

Name: _____

Score: _____

Question 1

Given ${}_{1|}q_{31} = 0.0042, {}_{2}p_{33} = 0.9906$, and an ultimate life table.

x	q_x	l_x	d_x
30		10,000	
31	0.0038		
32			
33		9,883	
34			48
35	0.0051		

(1a) Complete the ultimate life table (rounding errors are tolerable).

(1b) Under the UDD assumption over each year of age, calculate ${}_{1.7|2.5}q_{30.2}$ from the table.

(1c) Under the constant force of mortality assumption over each year of age, calcaulate ${}_{1.7|2.5}q_{30.2}$ from the table.

(1d) Mortality rates for non-smokers with 3-year term insurance are given in the following table:

x	$q_{[x]}$	$q_{[x-1]+1}$	$q_{[x-2]+2}$
30	0.0036	0.0036	0.0037
31	0.0038	0.0039	0.0040
32	0.0041	0.0043	0.0044
33	0.0043	0.0044	0.0046
34	0.0047	0.0047	0.0048

Complete the following select life table by using the above ultimate table and mortality rates:

x	$l_{[x]}$	$l_{[x]+1}$	$l_{[x]+2}$	l_{x+3}	$x+3$
30					33
31					34

Question 2

You are given:

- $\mathring{e}_{30:\overline{40}|} = 27.692$
- $S_0(x) = 1 - \frac{x}{\omega}, 0 \leq x \leq \omega$
- T_x is the future lifetime variable for (x)

Calculate $Var(T_{30})$.

Question 3

Suppose ${}_sq_x = s \times q_x$ for positive integer x and $0 \leq x < 1$. Show that for positive integer x , $R_x = T_x - K_x$ has a uniform distribution on $(0, 1)$ and R_x is independent of K_x .

(*In this question, you shouldn't prove the result using UDD assumption; instead, use the given assumption of* ${}_sq_x = s \times q_x$.)