Chapter 7 – Past Test and Quiz Problems – Partial Year Policy Value

Ranya who is (21) purchases a whole life insurance policy with a death benefit of 100,000 payable at the end of the year of death. The policy has annual premiums. **The gross premium for this policy is 360.**

You are given:

i. Mortality follows that Standard Ultimate Life Table.

ii. $i = 0.05$

iii. Deaths are uniformly distributed between integral ages.

a. (2 points) The net premium is 260 to the nearest 10. Calculate the net premium to the nearest 0.01.

Solution:

$$PVP = PVB$$

$$P^n \ddot{a}_{21} == 100,000 A_{21} ==> P^n = \frac{(100,000)(0.051441)}{19.9197} = 258.24$$

b. (3 points) Calculated the net premium policy value at the end of 20 years.

Solution:

$${}_{20}V^n = PVFB - PVFP^n = 100,000 A_{41} - 258.24 \ddot{a}_{41}$$

$$= (100,000)(0.12665) - 258.24(18.3403) = 7928.80$$

$$Or$$

$${}_{20}V^n = (100,000)\left(1 - \frac{\ddot{a}_{41}}{\ddot{a}_{21}}\right) = (100,000)\left(1 - \frac{18.3403}{19.9197}\right) = 7928.83$$

Question Continued . . .

This policy has the following expenses:

i. First year expense of 400 per policy plus 53% of premium

ii. Expense of 50 per policy plus 5% of premium in years 2+

iii. Claim expense of 500 incurred at the end of the year of death

Per policy expenses are incurred at the beginning of the policy year.

c. (4 points) The gross premium policy value at the end of 20 years is 7370 to the nearest 10. Calculate the policy value to the nearest 0.1. Remember that the gross premium is 360.

Solution:

$$_{20}V^g = PVFB + PVFE - PVFP$$

$$= 100,000A_{41} + 50\ddot{a}_{41} + 0.05P\ddot{a}_{41} + 500A_{41} - P\ddot{a}_{41}$$

$$= (100,500)(0.12665) - [(0.95)(360) - 50](18.3403) = 7372.96$$

d. (4 points) Use the recursive formula to find the gross premium policy value at the end of 21 years.

Solution:

$$_{21}V^g = \frac{(_{20}V^g + 0.95P - 50)(1.05) - (100,500)q_{41}}{1 - q_{41}}$$

$$= \frac{(7372.96 + (0.95)(360) - 50)(1.05) - (100,500)(0.000565)}{1 - 0.000565} = 7995.94$$

e. (3 points) Calculate the gross premium policy value at time 20.7 years.

Solution:

$$_{20.7}V = (0.3)(7372.96 + 0.95P - 50) + (0.7)(7995.94) = 7896.65$$