Chapter 4 – Past Test and Quiz Problems – Insurance with Non-Level Benefits

(5 points) Alisa (20) buys a special whole life policy with a non-level death benefit. The death benefits are paid at the end of the year of death and are listed in the following table:

Years	Death Benefit
1-30	125,000
31-50	300,000
51+	50,000

Using the Standard Ultimate Life Table with $i = 5\%$, calculate the expected present value of this insurance.

Solution:

$$125,000A_{20} + 175,000_{30}E_{20}A_{50} - 250,000_{50}E_{20}A_{70}$$

$${}_{30}E_{2010}E_{20} \cdot {}_{20}E_{30}$$

$${}_{50}E_{20} \Rightarrow (1.05)^{-50}\left(\frac{l_{70}}{l_{20}}\right)$$

$$125,000(0.04922) + 175,000(0.61224)(0.37254)(0.18931)$$
$$- 250,000(1.05)^{-50}\left(\frac{91,082.4}{100,000}\right)(0.42818)$$

$$= 6152.5 + 7556.2482 - 8502.2897 = 5206.46$$

(5 points) Jimmy (30) buys a special 45 year term insurance policy with a non-level death benefit. The death benefits are paid at the end of the year of death and are listed in the following table:

Years	Death Benefit
1-20	100,000
21-35	50,000
36-45	25,000

Using the Standard Ultimate Life Table with $i = 5\%$, calculate the expected present value of this insurance.

Solution:

$$EPV = 100,000A_{30} - 50,000A_{50}({}_{20}E_{30}) - 25,000A_{65}({}_{35}E_{30}) - 25,000A_{75}({}_{45}E_{30})$$

$$= 100,000(0.07698) - 50,000(0.18931)(0.37254)$$
$$- 25,000(0.35477)(1.05)^{-35}\left(\frac{94,579.7}{99,727.3}\right) - 25,000(0.50868)(1.05)^{-45}\left(\frac{85,203.5}{99,727.3}\right)$$

$$= 1,437.577$$