Mathematics of Life Insurance 1

Final test

Max: 20 points   **Necessary: 14 points**

Part 1 (3 points)

A mortgage of £120,000 is repaid over 20 years by equal monthly payments. How much is every payment on the basis of an effective interest rate of 5.89% p.a.? Suppose that the rate increases by one percent point after eleven years. Compute the revised monthly payments for the remaining time.

Part 2 (3 points)

If $\mu_x = \frac{3}{100-x} - \frac{10}{250-x}$ for $40 < x < 100$, calculate $_{40}p_{50}$.

Part 3 (4 points)

Using the commutation functions, derive an explicit formula for the net single premium of the m-years deferred standard increasing life annuity in arrear with duration n years, $_{m|}(Ia)_{x:\overline{n|}}$. Begin with formulating Y.

Part 4 (4 points)

Show that under the assumption of linearity it holds

$$A_x^{(m)} = \frac{i}{i^{(m)}} \cdot A_x.$$

Part 5 (6 points)

Consider m-years deferred term insurance for n years, where the annual net premium is paid $m' < m$ years. Moreover, during the period when the premium is paid the premium refund agreement is active. In the case of death of the insured person, the premium paid until the death is returned to a beneficiary at the end of the year of death. Derive the total loss and the annual net premium (both expressed with the use of actuarial notation and with the use of commutation functions).