Mathematics of Life Insurance 1 - Sample test

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

Part 1 (3 points)

A loan of 1000 at a nominal rate of 12% convertible monthly is to be repaid by six monthly payments with the first payment due at the end of the first month. The first three payments are x each, and the final three payments are $3x$ each. Calculate x.

Part 2 (3 points)

Given $\mu_{x+t} = \frac{1}{85-t} + \frac{3}{105-t}$ for $0 \leq t < 85$, calculate ${}_{20}p_x$.

Part 3 (3 points)

Formulate the net single premium of the m-years deferred endowment with duration n years ${}_{m|}A_{x:\overline{n}|}$ as the expected value of Z in the sum form. Begin with formulating Z.

Part 4 (3 points)

What is the relation between $\ddot{a}_x$ and A_x? Derive it.

Part 5 (3 points)

Formulate the net single premium of the standard increasing temporary life annuity in advance with duration n years $(I\ddot{a})_{x:\overline{n}|}$ as the expected value of Y in the sum form. Begin with formulating Y.

Part 6 (5 points)

Consider m-years deferred term insurance for n years, where the annual net premium is paid m years. Moreover, for the first $m^{'}$ years (where $m^{'} < m$) during the deferment period the premium refund agreement is active. In the case of death of the insured person 80% of the premium paid until the death is paid to a beneficiary at the end of the year of death. Derive the total loss, the annual net premium and the net premium reserve.