1. Using ILT assumptions and the 2-term Woolhouse approximation, determine the actuarial present value of a 10-year temporary life annuity issued to (30) that pays 1000 at the beginning of each month.

2. Using ILT assumptions and the UDD assumption, determine the APV of a whole life annuity immediate with monthly payments of 500 issued to (35).

3. You are given:

   (i) $\mu_x = 0.02$
   (ii) $\delta = 0.04$
   (iii) $a_x = 8$

Using the 3-term Woolhouse approximation, determine $\bar{a}_x$. 
4. A whole life annuity issued to (50) pays continuously at an annual rate of $5 \cdot (1.06)^t$ at time $t$. Determine the APV of this annuity, given $\tau p_{50} = \left(\frac{40-t}{40}\right)^3$ and $i = 0.06$.

5. For a 4-state model, transitions can occur back and forth among states 0, 1, and 2. Once state 3 is entered, there is no transition out from it. You are given:

(i) $s p_{60}^{00} = 0.539 \quad s p_{80}^{01} = 0.173 \quad s p_{80}^{02} = 0.070 \quad s p_{80}^{03} = 0.218$
(ii) Using $i = 5\%$: $\bar{a}_{85}^{02} = 0.3403 \quad \bar{a}_{85}^{12} = 1.0883 \quad \bar{a}_{85}^{22} = 3.2367$
(iii) $i = 5\%$

Determine the actuarial present value of a 5-year deferred whole life annuity, issued to an 80-year old in state 0, that pays continuously at a rate of 10,000 per year while in state 2.