Each problem is worth 10 points. Show all work for full credit, and use correct notation.

1. For a fully discrete whole life insurance of 1000 issued to (20) with annual premiums of 3, use SULT actuarial assumptions to determine the variance of the loss-at-issue present value random variable.

2. For a fully discrete whole life insurance of 1000 issued to (20) with annual premiums determined by the equivalence principle, use SULT actuarial assumptions to determine the variance of the loss-at-issue present value random variable.
3. For an insurance issued to independent lives ($x$) and ($y$), a benefit of 10,000 is paid at the moment of the second death. Premiums are paid continuously at an annual rate of $\pi$ until the first death. Using $CF(\mu_x = 0.01, \mu_y = 0.02, \delta = 0.03)$ actuarial assumptions and the equivalence principle, determine $\pi$.

4. For a fully discrete 2-year term insurance issued to ($x$), you are given:
   i) the death benefit is 3000 in the first year and 5000 in the second year
   ii) $d = 0.05$
   iii) $q_x = 0.05$ and $1|q_x = 0.04$

   Determine the net annual premium.

5. For a fully discrete whole life insurance of 10,000 issued to ($x$) with annual premiums of 75, using $i = 0.05$, determine the minimum value of the curtate future lifetime random variable, $K$, such that the value of the loss-at-issue present value random variable is negative.