

Show all work for full credit, use correct notation., and clearly mark your answer.

1. For a fully discrete whole life insurance of 1000 on (50), you are given:
 - (i) The annual per policy expense is 1.
 - (ii) There is an additional first year expense of 15.
 - (iii) The claim settlement expense of 50 is payable when the claim is paid.
 - (iv) All expenses, except the claim settlement expense, are paid at BOY.
 - (v) Actuarial assumptions follow the Illustrative Life Table.
 - (a) (10 points) Calculate the level gross premium using the equivalence principle.
 - (b) (10 points) Calculate the expense load (i.e. the expense premium).

2. (10 points) For a fully discrete whole life insurance of 1000 on (60), you are given:

- (i) The expenses, payable at BOY, are:

Expense Type	First Year	Renewal Years
% of Premium	20%	6%
Per Policy	8	2

- (ii) The level gross premium is 41.20
- (iii) $i = 0.05$
- (iv) ${}_0L$ is the present value of the loss random variable at issue

Calculate the value of ${}_0L$ if the insured dies in the third policy year.

3. (10 points) For a special fully discrete 10-payment whole life insurance on (30) with level annual net premium π :

(i) The death benefit is equal to 1000 plus the refund, without interest, of the net premiums paid.

(ii) $A_{30} = 0.102$

(iii) ${}_{10|}A_{30} = 0.088$

(iv) $(IA)_{30:\overline{10}|}^1 = 0.078$

(v) $\ddot{a}_{30:\overline{10}|} = 7.747$

Calculate π .

4. (10 points) For a fully discrete whole life insurance of 100,000 on each of 10,000 lives age 60, you are given:

(i) The future lifetimes are independent.

(ii) Mortality follows the Illustrative Life Table.

(iii) $i = 0.06$.

(iv) π is the premium for each insurance of 100,000.

Using the normal approximation, calculate π , such that the probability of a positive total loss is 1%.

(Note: The 99th percentile of the standard normal distribution is 2.326.)