Case 1: A whole life insurance with reduced early sum insured is issued to a life age 50. The sum insured payable at the end of the year of death in the first two years is equal to 1000 plus the end year policy value in the year of death (that is, the policy value that would have been required if the life had survived). The benefit payable at the end of the year of death in any subsequent year is 20000. The annual premium P is calculated using the equivalence principle. The insurer calculates premiums and policy values using the standard select survival model, with interest at 6% per year and no expenses.

Case 2: A life aged 50 buys a participating whole life insurance policy with sum insured 10000. The premium is payable at the end of the year of death. The premium is payable annually in advance. The premium basis is the SSSM with $i = 4.5\%$ and

- Initial expense of 22% of the annual gross premium plus 100
- Renewal expenses of 5% of the gross premium plus 10

Assume that under the SSSM with 4.5% interest, we have

$$\bar{a}_{50} = 18.12588$$
$$A_{50} = 0.2194596$$
$$q_{[50]} = 0.001033293$$
$$q_{[50]+1} = 0.001264444$$

Case 3: A whole-life policy (with no upper bound $\omega$ on maximum age) is valued continuously, with

$$S_t = tV$$
$$e_t = 0 = E_t$$
$$\delta_t = \mu_{[x]+t} = \lambda > 0$$
$$P_t = P > 0$$
1. For Case 1,
   (a) $0 V > 0$
   (b) $0 V < 0$
   (c) $0 V = 0$

2. For Case 1, before solving for $P$, the policy value at time 1 can be written as
   (a) $1 V = 1.06P + q_{[50]}(1000 + 1 V)$
   (b) $1 V = 1.06P + q_{[50]}(1 V)$
   (c) $1 V = 1.06P - 1000q_{[50]}$
   (d) $1 V = 1.06P + 1000q_{[50]}$
   (e) None of the above

3. For Case 1, before solving for $P$, the policy value at time 2 can be written as
   (a) $2 V = 20000A_{52} - P\tilde{a}_{52}$
   (b) $2 V = 2000A_{52} - P\tilde{a}_{52}$
   (c) $2 V = 20000A_{52} + P\tilde{a}_{52}$
   (d) $2 V = 2000A_{52} + P\tilde{a}_{52}$
   (e) None of the above

4. For Case 2, solving for $P$ returns (after rounding to nearest whole number)
   (a) $P = 134$
   (b) $P = 145$
   (c) $P = 154$
   (d) $P = 231$
   (e) None of the above
5. For Case 2, solving for $V$ returns (after rounding to second decimal place)

(a) $V = 3.06$
(b) $V = 3.51$
(c) $V = 3.89$
(d) $V = 4.78$
(e) None of the above

6. For Case 3, if $P$ is determined such that $V > 0$, is there a value $T > 0$ where $TV = 0$?

(a) Yes
(b) No
(c) Maybe, but need more information

7. For premiums determined by the PPP, denoted by $PPP$ and premiums determined by the EPP, $P_{EPP}$, what is the value of $\lim_{N \to \infty} PPP$?

(a) $\lim_{N \to \infty} PPP = P_{EPP}$
(b) $\lim_{N \to \infty} PPP \neq P_{EPP}$
(c) Need more information