

**Quiz 1.**

For a special fully discrete 20–payment whole life insurance on (40):

- (i) The death benefit is 3000 for the first 10 years and is 5000 thereafter.
- (ii) The initial benefit premium paid during the each of the first 10 years is one fifth of the benefit premium paid during each of the 10 subsequent years.
- (iii) Mortality follows the Illustrative Life Table with  $i = 5\%$ .

1. Calculate the initial annual premium using E.P.
2. Now, assume that the net premium  $P$  is constant during the 20–year payment period. Calculate  $P$  using E.P.
3. Calculate the level net premium when the premium is paid for the whole life.

**Solution:**

1. The APV of death benefit is

$$\begin{aligned} 3000A_{40:\overline{10}|}^1 + 5000 {}_{10|}A_{40} &= 3000(A_{40} - {}_{10}E_{40}A_{50}) + 5000 {}_{10}E_{40}A_{50} = 3000A_{40} + 2000 {}_{10}E_{40}A_{50} \\ &= 3000 \times 0.12106 + 2000 \times 0.60920 \times 0.18931 = 593.84 \end{aligned}$$

Let the initial premium by  $P$ . Then the APV of all premiums is

$$5P\ddot{a}_{40:\overline{20}|} - 4P\ddot{a}_{40:\overline{10}|} = P(5 \times 12.9935 - 4 \times 8.0863) = 32.622 P$$

Therefore

$$P = \frac{593.84}{32.622} = 18.204.$$

2. If the premium is level we get  $APV(FP)_0 = P\ddot{a}_{40:\overline{20}|} = 12.9935P$  hence the E.P. implies that

$$P = \frac{APV(FB)_0}{\ddot{a}_{40:\overline{20}|}} = \frac{593.84}{12.9935} = 45.703$$

3. From the whole life payment premium we have

$$P = \frac{APV(FB)_0}{\ddot{a}_{40}} = \frac{593.84}{18.4578} = 32.173.$$