1. An annuity consists of \( n \) payments of 1, the first to be made at the end of 7 years and the others to be made at three year intervals thereafter. The rate of interest is \( i \) per annum effective. Derive an expression for the present value of this annuity in terms of \( a_7, a_7 \), and \( a_{3n+7} \).

2. Present value of a series of payments of 2 at the end of every 8 years forever is equal to 5. Calculate the effective rate of interest.

3. A perpetuity pays 1 at the end of every year, except that it pays 0 at the end of every 4th year. The effective interest rate is \( i \). Is the present value equal to \( \frac{s_3}{is_4} \)? Explain!

4. A man deposits $50 at the end of each quarter for 10 years. Find the total amount of interest that he has accumulated at the end of 10 years, if \( i = 0.045 \) for the first 5 years, and \( i^{(2)} = 0.05 \) for the second 5 years.

5. An annuity pays 1 at the end of each 4-year period for 40 years. Given \( a_4 = k \), find the present value of the annuity. Show work!

   \( \text{(A)} \frac{1-(1-ik)^3}{1-(1-ik)^5} \) \( \quad \text{(B)} \frac{1-(1-ik)^{30}}{1-(1-ik)^5} \) \( \quad \text{(C)} \frac{1-(1-ik)^5}{1-(1-ik)^6} \) \( \quad \text{(D)} \frac{1-(1-ik)^{30}}{(1-ik)^{20}-1} \) \( \quad \text{(E)} \frac{1-(1-ik)^5}{(1-ik)^{20}-1} \).