2. Solution: E

Accumulated value end of 40 years =
$100\,[(1+i)^4 + (1+i)^8 + \ldots\ldots..(1+i)^{40}]= 100\,((1+i)^4)[1-((1+i)^4)^{10}]/[1 - (1+i)^4]$
("Sum of finite geometric progression =
1st term times [1 – (common ratio) raised to the number of terms] divided by [1 –common ratio]")
and accumulated value end of 20 years =
$100\,[(1+i)^4 + (1+i)^8 + \ldots\ldots..(1+i)^{20}]=100\,((1+i)^4)[1-((1+i)^4)^5]/[1 - (1+i)^4]$

But accumulated value end of 40 years = 5 times accumulated value end of 20 years
Thus, $100\,((1+i)^4)[1-((1+i)^4)^{10}]/[1 - (1+i)^4] = 5\,\{100\,((1+i)^4)[1-((1+i)^4)^5]/[1 - (1+i)^4]\}$
Or, for $i > 0$, $1-((1+i)^{40} = 5\,[1-((1+i)^{20}]$ or $[1-((1+i)^{40}]/[1-((1+i)^{20}] = 5$

But $x^2 - y^2 = [x-y]\,[x+y]$, so $[1-((1+i)^{40}]/[1-((1+i)^{20}]= [1+((1+i)^{20}]$ Thus, $[1+((1+i)^{20}] = 5$ or $(1+i)^{20} = 4$.
So X = Accumulated value at end of 40 years = $100\,((1+i)^4)[1-((1+i)^4)^{10}]/[1 - (1+i)^4]$
$=100\,(4^{1/5})[1-((4^{1/5})^{10}]/[1 – 4^{1/5}] = 6194.72$

<u>Alternate solution using annuity symbols</u>: End of year 40, accumulated value = $100(s_{\overline{40|}} / a_{\overline{4|}})$, and end of year 20 accumulated value = $100(s_{\overline{20|}} / a_{\overline{4|}})$. Given the ratio of the values equals 5, then $5 = (s_{\overline{40|}} / s_{\overline{20|}}) = [(1+i)^{40} - 1]/[(1+i)^{20} - 1] = [(1+i)^{20} + 1]$. Thus, $(1+i)^{20} = 4$ and the accumulated value at the end of 40 years is $100(s_{\overline{40|}} / a_{\overline{4|}}) = 100[(1+i)^{40} - 1]/[1-(1+i)^{-4}] = 100[16-1]/[1-4^{-1/5}] = 6194.72$

<u>Note</u>: if i = 0 the conditions of the question are not satisfied because then the accumulated value at the end of 40 years = 40 (100) = 4000, and the accumulated value at the end of 20 years = 20 (100) = 2000 and thus accumulated value at the end of 40 years is not 5 times the accumulated value at the end of 20 years.