Question: Derivative Valuation and Analysis   **(22 points)**

The table below shows current interest rates for T-Notes and swaps. All the T-Note, swap and Libor payments are made once a year. The "Spot" column for the T-Notes shows the yields of the corresponding discount (zero-coupon) bonds.

Table: T-Note and swap interest rates

Year	T-Note		Swap
	Spot	Par Yield	
1	2.00%	2.00%	2.40%*
2	2.50%	2.49%	2.83%
3	2.80%	2.79%	3.09%
4	3.00%	(a1)	3.26%
5	3.20%	3.17%	(b2)

Note: Swap floating payment is based on 1-year Libor and the swap interest rate in the table indicates the fixed-interest payment against it. All the T-Notes and swaps pay interest once a year. An asterisk (*) indicates that the rate is equivalent to the 1-year Libor interest rate.

a) Although the actual swap floating payment is based on Libor, assume that it is based on the 1-year T-Note interest rate in these questions.

   a1) What is the par yield (in percent) of the 4-year T-Note? Show your calculations.
   (4 points)

   a2) While it is not yet known what the floating payment will be in 3 years (the 1-year interest rate beginning in 2 years from now), the interest payable can be fixed. Calculate such a forward rate, $F_{2,3}$, applicable to a 1-year period starting in 2 years. (4 points)

b) The swap floating payment is actually based on the 1-year Libor, which is ordinarily higher than the 1-year interest rate for T-Notes. The difference between them is called the TED spread [an acronym formed from the T-Bill and ED, the ticker symbol for the Eurodollar futures contract]. The fixed swap rate is determined based on this. The equation below illustrates the relationship between the TED spread (the difference between the 1-year Libor and the 1-year T-Note) in year t and the previous (t-1) year's TED spread, both in percent:

$$TED_t = 0.12 + 0.40 \cdot TED_{t-1}$$

   b1) The 1-year TED spread is currently 0.40%. What is the average TED forecast (in percent) for the next 5 years? Show your calculations.   (5 points)

   b2) What is the 5-year swap rate (the fixed interest rate) in percent? Show your calculations.   (5 points)

c) Company X is considering how to finance capital investments over the next four years. It is possible to use a combination of rolling short-term borrowings (re-borrowed every year) and a swap to effectively borrow at a fixed interest rate. Describe the transaction required to do so. Assuming that Company X can borrow annually at Libor +0.30% over the next four years, what will be the fixed interest rate in percent? (4 points)