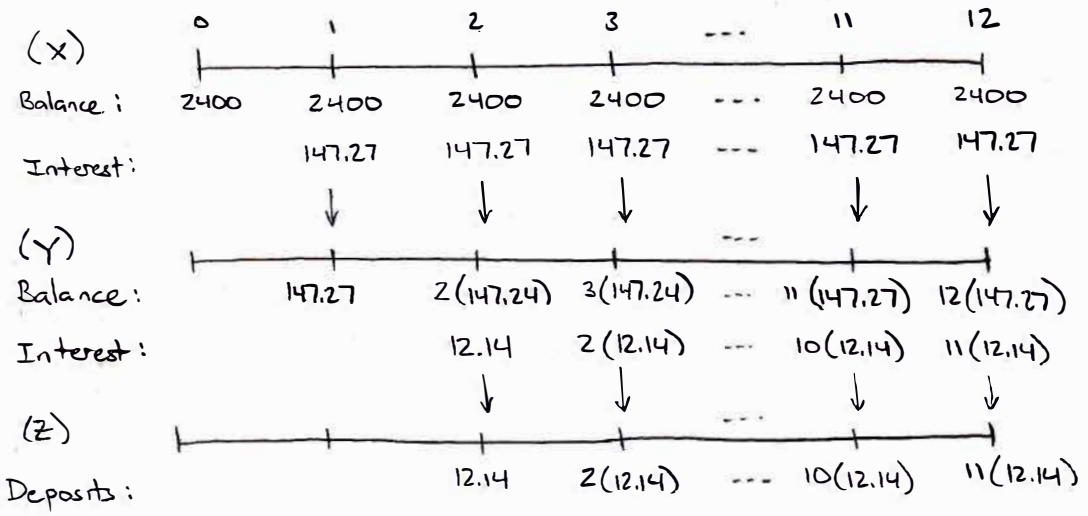
HW 3.1 (b) Key

1. At time $t = 0$, Sebastian invests 2400 into a fund earning 6% convertible quarterly, but payable annually. He reinvests each interest payment in individual separate funds each earning 8% convertible quarterly, but payable annually. The interest payments from the separate funds are accumulated in a side fund that guarantees an annual effective rate of 11%. Determine the total value of all funds at $t = 12$. [5.a-c #02]

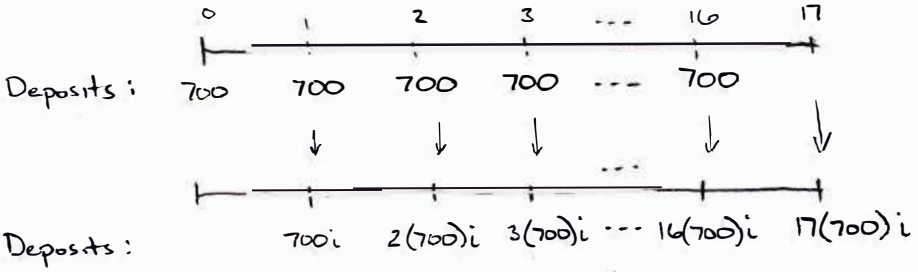
[A] 5,350 B) 4,922 C) 5,029 D) 5,136 E) 5,243



$$AV = 2400 + 12(147.27) + 12.14(Is)\overline{11}|11\% = \boxed{5349.59}$$

2. Victor invests 700 into a bank account at the beginning of each year for 17 years. The account pays out interest at the end of every year at an annual effective interest rate of i%. The interest is reinvested at an annual effective rate of $(i/2)$%. The yield rate on the entire investment over the 17 year period is 9% annual effective. Determine i. [5.a-c #04]

[A] 11.1% B) 11.5% C) 11.8% D) 12.1% E) 12.5%



$$700\,\ddot{s}\overline{17}|9\% = 17(700) + 700i(Is)\overline{17}|i/2$$

$$28,210.94 = 11,900 + 700i(Is)\overline{17}|i/2$$

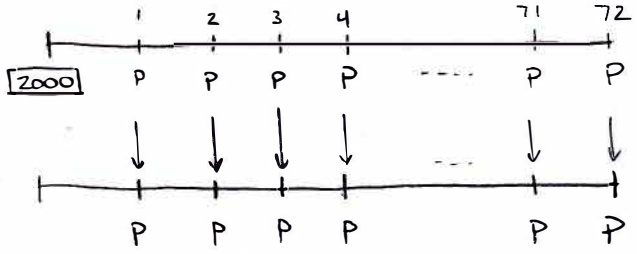
$$i(Is)\overline{17}|i/2 = 23.3013$$

$$\therefore \frac{\ddot{s}\overline{17}|i/2 - 17}{i/2} = 23.3013 \rightarrow \ddot{s}\overline{17}|i/2 - 17 = 11.6507 \rightarrow \ddot{s}\overline{17}|i/2 = 28.6507$$

$$\rightarrow s\overline{18}|i/2 = 29.6507 \rightarrow i/2 = 5.5609 \rightarrow \boxed{i = 11.12\%}$$

3. Sally lends 2,000 to Tim. Tim agrees to pay back the loan over 6 years with monthly payments payable at the end of each month. Sally can reinvest the monthly payments from Tim in a savings account paying interest at 11.4%, compounded monthly. The yield rate earned on Sally's investment over the 6-year period turned out to be 12.8% compounded semiannually. What nominal rate of interest, compounded monthly, did Sally charge Tim on the loan? [5.a-c #05]

A) 13.8% B) 12.14% C) 12.56% D) 12.97% E) 13.39%



$j = 0.0095$

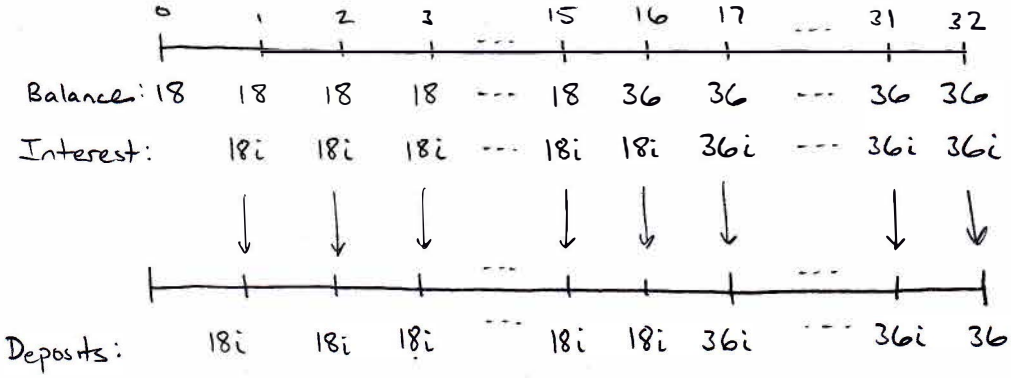
$$2000(1.064)^{12} = P\,s_{\overline{72}|j}$$

$$P = 41$$

$$2000 = 41\,a_{\overline{72}|k} \rightarrow k = 1.1502\% \rightarrow \boxed{i^{(12)} = 13.8\%}$$

4. Eric deposits 18 into a fund at time 0 and an additional 18 into the same fund at time 16. The fund credits interest at an annual effective rate of i. Interest is payable annually and reinvested at an annual effective rate of $0.5i$. At time 32, the accumulated amount of the reinvested interest payments is equal to 90. Calculate i, $i > 0$. [5.a-c #07]

A) 6.6% B) 5.8% C) 6% D) 6.2% E) 6.4%



$$90 = 18i\,s_{\overline{32}|0.5i} + 18i\,s_{\overline{16}|0.5i}$$

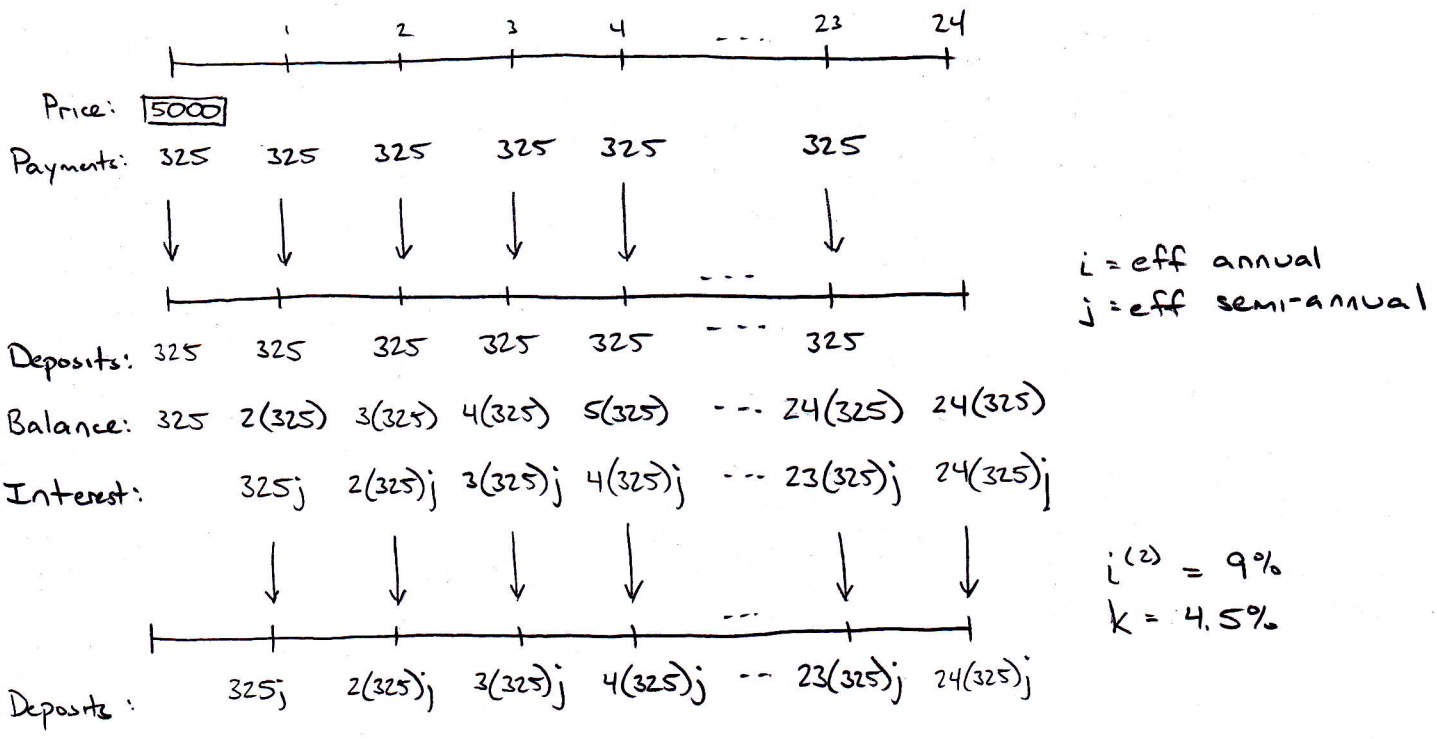
$$90 = 36\left[(1+0.5i)^{32}-1\right] + 36\left[(1+0.5i)^{16}-1\right]$$

$$36(1+0.5i)^{32} + 36(1+0.5i)^{16} - 162 = 0$$

$$(1+0.5i)^{16} = 1.6794 \rightarrow \boxed{i = 6.587\%}$$

5. Bill purchases an annuity at a price of 5,000. The annuity makes payments of 325 at the beginning of every 6 months for 12 years. The payments are reinvested in a fund which earns interest at an annual effective rate *i*. Interest payments are received every 6 months and reinvested at a nominal rate of 9% convertible semiannually. Bill realizes an overall effective annual yield of 10% on his original investment over the 12-year period. Calculate *i*. [5.a-c #08]

A) 11.48% B) 10.79% C) 11.14% D) 11.83% E) 12.17%



$$5000(1.10)^{12} = 24(325) + 325j\,(Is)_{\overline{24}|k}$$

$$j = 5.585\%$$

$$\boxed{i = 11.48\%}$$