Question 1. Fund X has unit values which are 1.0 on January 1, 2015, .8 on July 1, 2015 and 1.0 on January 1, 2016. A fund manager receives contributions of 100,000 on January 1, 2015 and 100,000 on July 1, 2015 and immediately uses the entire contributions to purchase units in Fund X. Find the time-weighted and dollar-weighted rates of return for 2015.

**Time-weighted**

On Jan 1, 100,000 is equal to 100,000 units. Its value becomes 100,000 \( \times \) 0.8 = 80,000 on July 1. After deposit 100,000, there will be \( \frac{100,000 + 100,000}{0.8} \) units in the fund.

\[ \frac{225,000}{180,000} \]

The value on Jan 1, 2016 will be 225,000 \( \times \) 1.0 = 225,000

**Time-weighted return** = \( \frac{80,000 \times 225,000}{100,000 \times 180,000} - 1 \)

= 0%

**Dollar-weighted.**

100,000 \( (1 + i) \) + 100,000 \( (1 + \frac{i}{2}) \) = 225,000

150,000 \( i \) = 25,000

\[ i = 0.16667 \]

Questions 2 is on the back of the page.
Question 2. Smith buys 1000 shares of stock at 5.00 per share. Six months later Smith receives a cash dividend of .20 per share, which Smith immediately reinvests in shares at a price of 4.00 per share. Six months after that Smith buys another 500 shares at a price of 4.50 per share. Six months after that Smith receives another cash dividend .25 per share and sells all the existing shares at 5.00 per share. Find the internal rate of return for Smith’s transaction in the form $i^{(2)}$.

\[
\begin{array}{cccccc}
\text{Time} & 0 & 6 & 12 & 18 \\
\text{Cash Flow} & -5000 & 200 & -2250 & 8137.5 \\
\end{array}
\]

6 months later, he gets $1000 \times 0.2 = 200$ and reinvests in shares at a price of 4. He gets $\frac{200}{4} = 50$ shares. Net cash flow at 6th month is 0, total shares are 1050. 6 months later, he buys 500 shares for $500 \times 4.5 = 2250$. The total number of shares is 1550. 6 months later, he receives $1550 \times 0.25 = 387.5$.

\[
-5000(1+j)^3 - 2250(1+j) + 8137.5 = 0
\]

\[
j = 0.069301
\]

\[
\therefore i^{(2)} = 2 \times j = 9.86\%
\]