Question 1

Given:

Annual Revenue = 10,000,00 for 10 years
Reduction after 10 years = 100000 each year

interest rate = compounded annualy = $i = 9.5\%$.
Future worth = $F = ?$

For first 10 years, Annuity = 1000000
For next 10 years, Annuity = 900000
↳ For same 10 years, Geometric series = 100,000

Now

$$F_1 = 1000,000\,(F/A, 9.5\%, 10)(F/P, 9.5\%, 10)$$

$$F_1 = 1000,000\left\{\frac{(1+i)^{10}-1}{i}\right\}\{1+i\}^{10}$$

$$F_1 = 1000000\left\{\frac{(1.095)^{10}-1}{0.095}\right\}(1.095)^{10}$$

$$F_1 = 1000000(15.56)(247)$$

$$\Rightarrow \boxed{F_1 = \$38433200}$$

$$F_2 = 900000\,(F/A, 9.5\%, 10)$$

$$900000\left\{\frac{(1+0.095)^{10}-1}{0.095}\right\}$$

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$= 900000(15.56)$

$F_2 = \$14004261.6$

$P = G_7(P/G, 9.5\%, 10)$

$= 100000\left\{\frac{(1+i)^{10} - i \times 10 - 1}{i^2(1+i)^{10}}\right\}$

$= 100000\left\{\frac{(1.095)^{10} - 0.95 - 1}{(0.095)^2(1.095)^{10}}\right\}$

$= 100000(23.61)$

$P = \$2361000$

$F_3 = 2361000(F/P, 9.5\%, 10)$

$= 2361000(2.47)$

$F_3 = \$5851095.39$

$F = F_1 + F_2 + F_3 = \$58288556.99$

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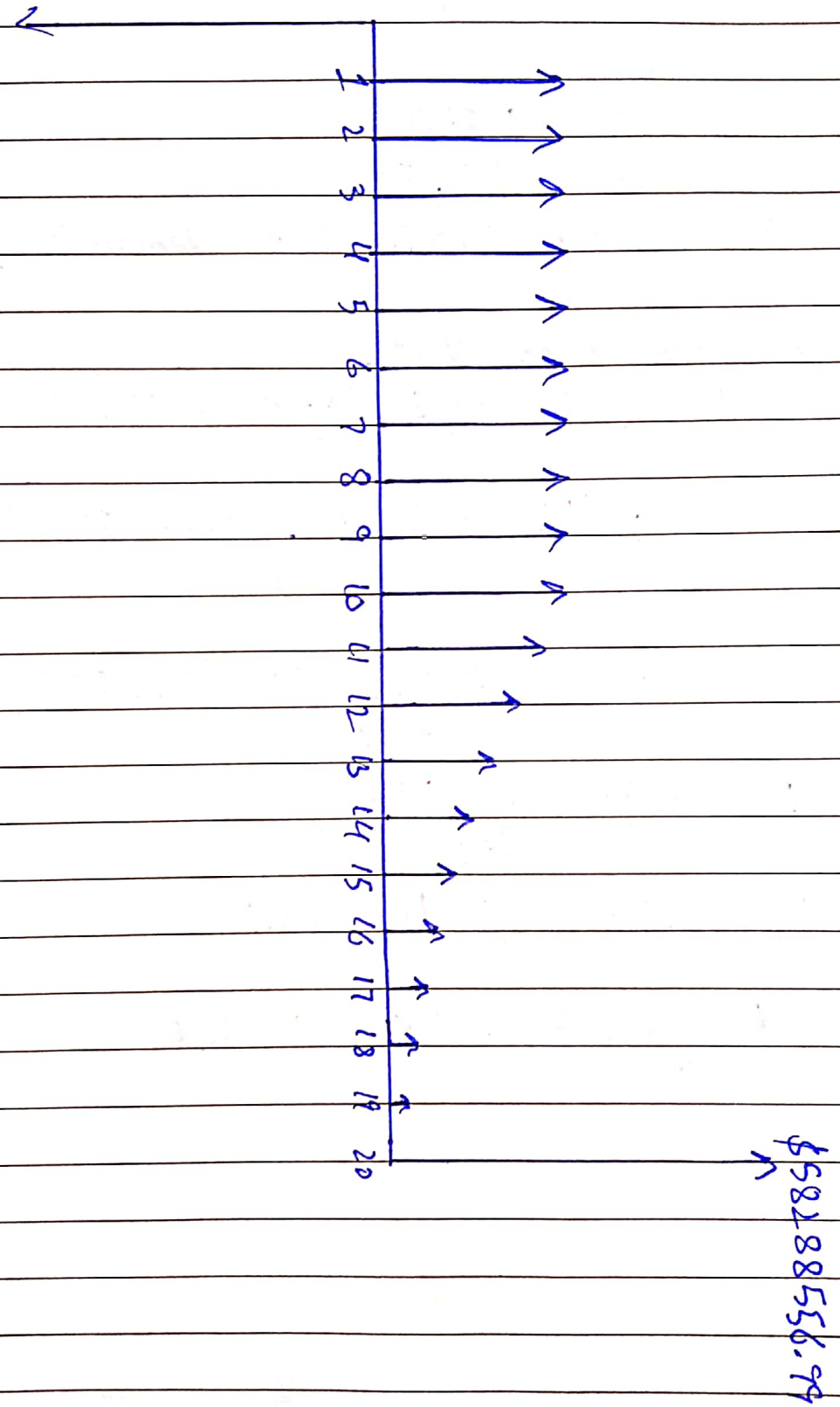
Cash Flow Diagram:



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(Question 2)

Given:

$P = \$10,000,000$

$i = 8.5\%$

Annuaty = A for 1st 8 years

= 3A for next 5 years

5A for last 7 years

$N = 20$ years

$A = ?$

Take Annuaty = A for 20 years

Take Annuaty = 2A for 5 years from 9th year

Take Annuaty = 2A for 7 years for last 7 years

Now

$$P_1 = A(P/A, i\%, N)$$

$$= A\left\{\frac{(1+i)^N - 1}{i(1+i)^N}\right\} = A\left\{\frac{(1.085)^{20} - 1}{0.085(1.085)^{20}}\right\}$$

$$\Rightarrow P_1 = 9.463A$$

$$P_2 = 2A(P/A, 8.5\%, 12)(P/F, 8.5\%, 8)$$

$$= 2A\left\{\frac{(1.085)^{12} - 1}{0.085(1.085)^{12}}\right\}\left\{(1.085)^{-8}\right\}$$

$$P_2 = 7.6487A$$

$$P3 = 2A(P/A, 8.5\%, 7)(P/F, 8.5\%, 13)$$

$$= 2A(5.118)(0.34)$$

$$P_3 = 3.48A$$

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Now

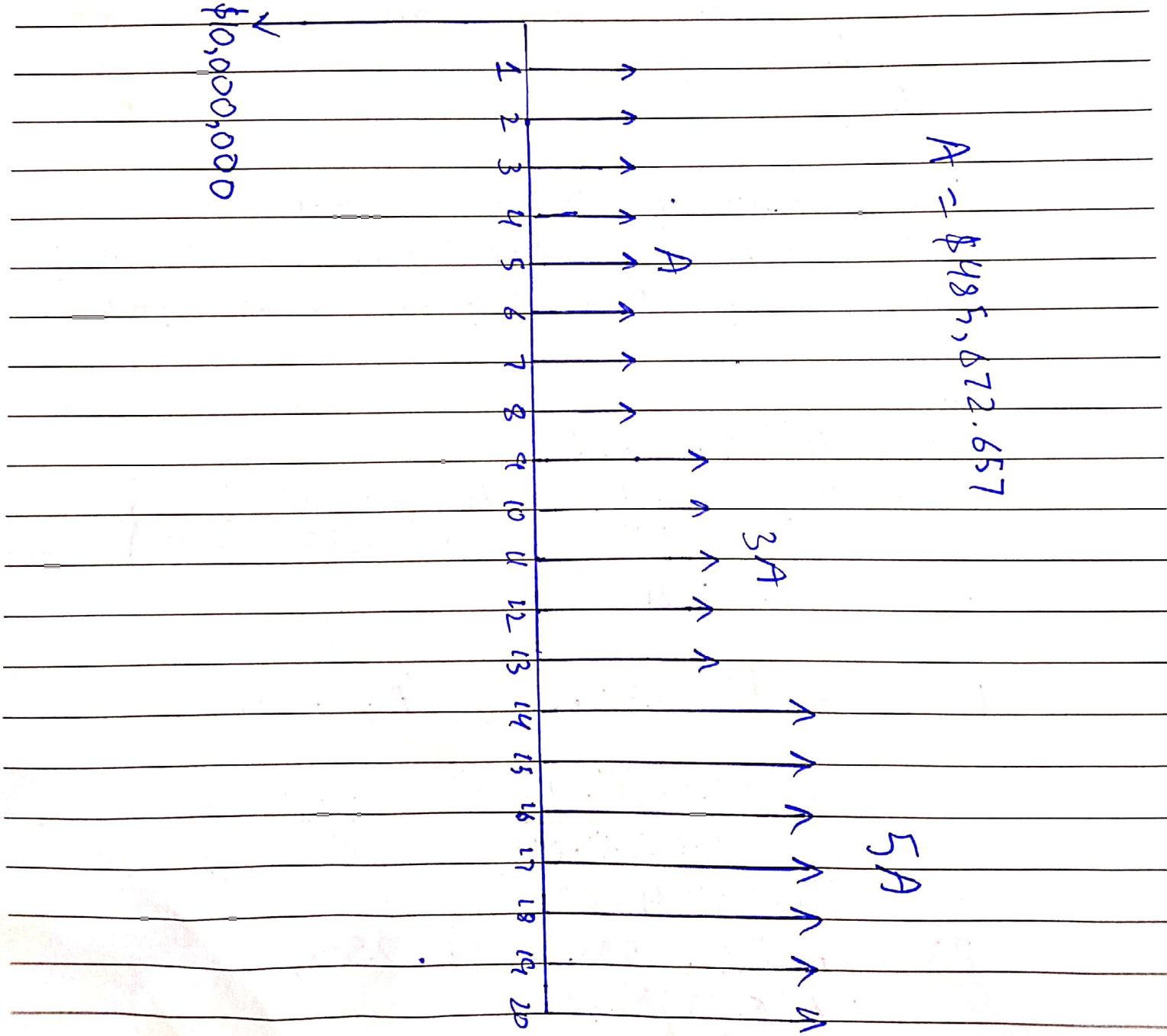
$$P_1 + P_2 + P_3 = P$$

$$9.46A + 7.65A + 3.48A = 10,000,000$$

$$20.59A = 10,000,000$$

$$A = \$485,672.657$$

Cash Flow Diagram:



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(Question 3)

Solution:

$a = 4500$

$b = 80$

$CV = \$850$

$CF = \$8,500$

Range of Profitable demands = ?

As we know that

$$D = \frac{-(a-cv) \pm \sqrt{(a-cv)^2 - 4(-b)(-CF)}}{2(-b)}$$

$$= \frac{-(4500-850) \pm \sqrt{(4500-850)^2 - 4(-80)(-8500)}}{2(-80)}$$

$$= \frac{-3650 \pm \sqrt{13322500 - 2720000}}{-160}$$

$$D = \frac{-3650 \pm 3256.2}{-160}$$

$D_1 = 2.46$ & $D_2 = 43.16$

$$\text{Range} = \{2.46 \leq D \leq 43.16\}$$

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(Question 4)

Solution:

Present worth = Total costs

Total costs = 500,000 + 650,000 + 550,000 + 250,000

Annual Revenue = 600,000 for 12 years

Salvage value = 500,000 + 250,000 + 60000 + 6250,000

Annual cost = $435,000

MARR = 9.5%

Initial cost = $1950,000

Capital Recovery cost = $CR(i\%) = (I-S)(A/P, i\%, N) + S(i\%)$

Net Annuity = 600000 − 435000

Annual worth = $165000 = R-E

Now

$$AW(i\%) = R - E - CR(i\%)$$
$$= \$165,000 - \{(I-S)(A/P, i\%, N) + S(i\%)\}$$

$$AW(9.5\%) = 165000 - \{(1950,000 - 1460,000)(A/P, 9.5\%, 12) + 1460000 \times 9.5\%\}$$
$$= 165000 - \left\{490\left\{\frac{(1.095)^{12} \times 0.095}{(1.095)^{12} - 1}\right\} + 138700\right\}$$
$$= 165000 - \{490(0.143) + 138700\}$$
$$= 165000 - 138770.16$$

Date:

$AW(9.5\%) = \$26229.84$

As AW is greater than 0 thus the project is accepted and the person should invest in this mall.