chapter 8 homework solution

(12) : solved in class

(14) : solved in class.

(21) $NPWA(12\%) = 10{,}000(P|F, 12\%, 1) + 5000(P|F, 12\%, 2) + 10{,}000(P|F, 12\%, 3)$
$+ 6000(P|F, 12\%, 4) - 20{,}000$

$= 10{,}000(0.8929) + 5000(0.7972) + 10{,}000(0.7118)$
$+ 6000(0.6355) - 20{,}000 > 0$

$\Rightarrow IRRA > 12\%$

$NPWB(12\%) = 10{,}000(0.8929 + 0.7972 + 0.7118)$
$- 20{,}000 > 0$

$\Rightarrow IRRB > 12\%$

$NPWC(12\%) = 5000(0.8929 + 0.7972 + 0.7118) +$
$15{,}000(0.6355) - 20{,}000 > 0$

$\Rightarrow IRRC > 12\%$

since the investments have the same value of initial cost, manage item according to higher benefits.

Year	C	B	A
0	-$20,000	-$20,000	-$20,000
1	5000	10,000	10,000
2	5000	10,000	5000
3	5000	10,000	10,000
4	15000	0	6,000

Next consider (B - C)

year	B - C
0	0
1	5000
2	5000
3	5000
4	-15000

$NPW_{(B-C)}(12\%) = 5000(0.8929 + 0.7972 + 0.7118] - 15000(0.6554)$

$\geq 0 \Rightarrow IRR(B-C) > MARR$

$\Rightarrow$ select B

Next consider A - B

year	A - B
0	0
1	0
2	-5000
3	0
4	6000

$NPW_{(A-B)}(12\%) = -5000(0.7972) + 6000(0.6554) < 0$

$\Rightarrow$ select [B]

$\Rightarrow$ final selection is [B]

Now compute IRR B. (B is a simple investment which has a unique (+) IRR value)

$$\left(\frac{\text{Sum of upper flows} - \text{Lower flows}}{\text{Lower flows}}\right) = 0.5$$

$$\frac{0.5}{4} = 0.125 \simeq 12.5\%$$

(2)

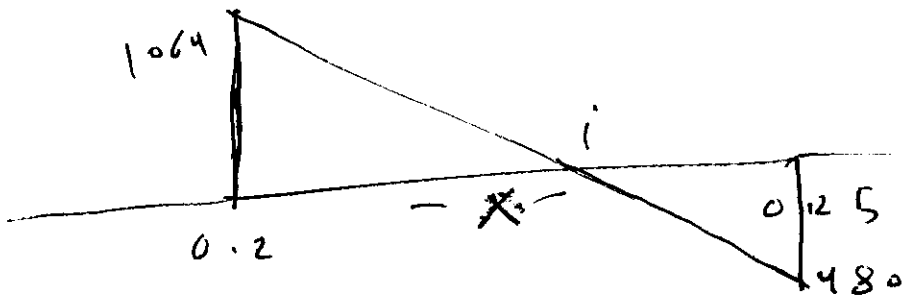
Try $i = 15\%$

$NPW_B(15\%) = 10{,}000(0.8333 + 0.6944 + 0.5787)$

$NPW(20\%) = 10{,}000(0.8333 + 0.6944 + 0.5787)$
$-20{,}000 = 1064$

$NPW(25\%) = 10{,}000(0.8 + 0.64 + 0.512) - 20{,}000$
$= -480$

$\Rightarrow 20\% < IRR < 25\%$



$\frac{X}{0.05 - X} = \frac{1064}{480} \Rightarrow X = 0.0345$

$\Rightarrow i = 0.2 + 0.0345 = 0.2345$

$\Rightarrow$ **$IRR_B \simeq 23.45\%$**

(27) In this example I will avoid showing that each investment has an IRR ≥ MARR. Since for the finally selected investment I shall compute its IRR.

Arranging the investments according to first cost ⟹

	A	D	C	B
Initial cost	$2000	$3000	$4000	$5000
Annual benefit	800	1300	400	500
Salvage value	2000	3000	1400	1500
life	5	4	7	6

MARR = 6%.

First consider D − A

period	D − A
0	−$1000
1	500
2	500
3	500
4	3300
5	−2800

$NPW_{(D-A)}(6\%) = 500(P|A, 6\%, 4) + 3000(P|F, 6\%, 4) - 2800(P|F, 6\%, 5)$

$\quad - 1000$

$= 500(3.465) + 3000(0.7921) - 2800(0.7473)$

$\quad - 1000 > 0$

⟹ Select (D)

Next consider the incremental investment: C − D

period	C − D
0	− $1000
1	− 900
2	− 900
3	− 900
4	− 390
5	400
6	400
7	1800

$NPW_{(C-D)}(6\%) < 0 \Rightarrow$ select D

Next consider the incremental investment: B − C

period	B − C
0	− $1000
1	100
2	100
3	100
4	100
5	100
6	1600
7	− 1800

$NPW_{(B-C)}(6\%) = 100(P|A, 6\%, 6) + 1500(P|F, 6\%, 6)$

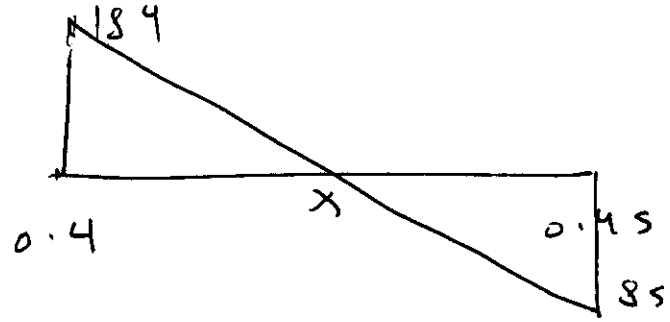
$- 1800(P|F, 6\%, 7) - 1000$

$= \; < 0 \Rightarrow$ select D.

Now compute IRRD.

→ NPWD (40%) = 184

NPWD (45%) = −85.



By interpolation: $\frac{x}{0.05 - x} = \frac{184}{85} \Rightarrow x = 0.0332$

$\Rightarrow i = 0.4 + 0.0332 = 0.4332$

$\Rightarrow$ IRRD $\simeq$ 43.32%.

(34) Investments in ascending initial cost order are:

	A	B	C	D
First cost	$10,000	$15,000	$25,000	$30,000
Net benefit (annual)	2000	3000	4500	5000

Since the information does not include the service life of the equipment or the salvage value, Let us assume that the equipment is to be sustained indefinitely, and treat the initial cost into a capitalized cost in which case we can use the annual cash flow for the rate of return calculation: $NEUA(i) = 0$.

For equipment A: $EUAC = 10,000\,i \Rightarrow IRR = 20\%$
$EUAB = 2000$

for equipment B: $EUAC = 18,000\,i \Rightarrow IRR = 16.6\%$
$EUAB = 3000$

for " C: $EUAC = 25,000\,i \Rightarrow IRR = 18\%$
$EUAB = 4500$

Fo " D: $EUAC = 30,000 \Rightarrow IRR = 16.6\%$
$EUAB = 5000$

Next consider the incremental investment: (B − A)

$EUAC = 8000\,i \Rightarrow IRR = 12.5\% < 15\%$
$EUAB = 1000$ $\Rightarrow$ select A

Next " " " " (C − A)

$EUAC = 15,000\,i \Rightarrow IRR = 16.6\% > 15\%$
$EUAB = 2500$ $\Rightarrow$ Select C

Next " " " " (D − C)

$EUAC = 5000\,i \Rightarrow IRR = 10\% < 15\%$
$EUAB = 500$ $\Rightarrow$ select C

final selection C with $IRR_C = 18\%$

(7)