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EoE Assignment: Capital Budgeting

Q1)

a. Payback Period = $\frac{\text{Initial investment}}{\text{Annual Cash flows}}$ years

$\therefore$ Payback Period = $\frac{100000}{35027} = 2.855$ years

$\therefore$ Payback Period for project zz is **2.855 years**

b. Discounted payback period assuming a 10% cost of capital

Year	Cash flows	Present Value	Discounted cash flow	Cumulative cash flow
0	-100000	1.000	-100000	-100000
1	35027	0.909	31839.543	-68,160.457
2	35027	0.826	28932.302	-39228.155
3	35027	0.751	26305.277	-12,922.878
4	35027	0.683	23923.441	+11000.563

Discounted payback period = $3 + \frac{12922.878}{23923.441} = 3.54$ years

c) Discounted payback period, assuming 16% cost of capital

Year	Cash flows	Present Value	Discounted cash flow	Cumulative cash flow
0	-100000	1.00	-100000	-100000
1	35027	0.862	30193.274	-69806.726
2	35027	0.743	26025.061	-43781.665
3	35027	0.641	22452.307	-21329.358
4	35027	0.552	19334.904	-1.994.454

Even after 4 years, the investment is not recovered. So there is no year where investment is break-even.

Hence Discounted Payback Period cannot be calculated, as investment is never recovered

d) NPV at 10% cost of capital

The present value of annuity of $1 for 4 years at 10% per annum interest is 3.1699.

∴ The present value of 35027 = 35027 x 3.1699

= 111032.0873

We know initial investment is $100,000

∴ NPV = 111032.0873 − 100000

NPV = $11032.0873

Hence, the project is accepted at 10% cost of capital

e) NPV at 16% cost of capital

The present value of annuity of $1 for 4 years at 16% per annum interest is 2.7982

∴ present value of 35027 = 35027 x 2.7982

= 98012.5514

∴ NPV = 98012.5514 − 100,000

NPV = − $1987.4486

Hence, the project should be rejected at 16% cost of capital

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f. Profitability Index (PI) = $\frac{\text{Present Value of Cash Inflows}}{\text{Initial Investment}}$

Considering the case of 10% cost of capital

$$PI = \frac{111032.0873}{100,000} = 1.110321$$

Profitability Index at 10% cost of capital is **1.110321**

PI > 1, hence proposal can be accepted

g. considering the case of 16% cost of capital.

$$PI = \frac{\text{Present Value of Cash Inflows}}{\text{Initial Investment}}$$

$$= \frac{98012.5514}{100000} = 0.98013$$

Profitability Index at 16% cost of capital is **0.98013**

PI < 1, hence proposal is rejected

h. Internal Rate of Return (IRR) = $X + \frac{Px - I}{Px - Py}(Y - X)$

where, Y = higher discount rate,

X = lower " "

Px = Present value of cash inflows at X

Py = " " " " " " Y

I = Initial Investment

$$IRR = 10 + \frac{111032.0873 - 100000}{111032.0873 - 98012.5514}(16 - 10)$$

$$IRR = 10 + 5.08409 = 15.08\%.$$

IRR of the Internal return rate for the project is **15.08%.**

i. MIRR (Modified Internal rate of return) $= \sqrt[n]{\frac{FV}{I}} - 1$

where I = Initial investment

FV = Future value at given reinvestment rate

n = number of years.

We have reinvestment rate = 0% and n = 4

$\therefore$ MIRR $= \sqrt[4]{\frac{350274}{100000}} - 1 = 0.0879$

$\therefore$ MIRR = 8.79% when reinvestment rate is 0%.

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j. We have reinvestment rate = 10%.

$\therefore FV = 35027(1 + 1.1 + 1.1^2 + 1.1^3) = 162560.307$

$MIRR = \sqrt[4]{\frac{162560.307}{100000}} - 1 = 0.1291$

$\therefore$ **MIRR = 12.91%** when reinvestment rate is 10%.

Q2)

a. cost of capital = 5%.

~~Present value~~

NPV = present value of cash inflow − Present value of cash outflow

NPV of Thing 1 = $(3293 \times 3.545) - 10000$
= 1673.685

NPV of Thing 2 = $(14641 \times 0.823) - 10000$
= 2049.543

NPV of Thing 2 > NPV of Thing 1.

Hence **Thing 2** must be chosen. when cost of capital is 5%

b. cost of capital = 8%.

NPV of Thing 1 = $(3293 \times 3.312) - 10000$
= 906.41

NPV of thing 2 = (14641 × 0.735) - 10000
= 761.135

NPV of Thing 1 > NPV of Thing 2

∴ **Thing 1** must be chosen when cost of capital is 8%.

c) cost of capital = 11%

NPV of Thing 1 = (3293 × 3.102) - 10000
= 214.886

NPV of Thing 2 = (14641 × 0.658) - 10000
= -366.22

NPV of Thing 1 > NPV of Thing 2.
Moreover, NPV of Thing 1 > 0 while NPV of Thing 2 < 0
∴ **Thing 1** must be chosen when cost of capital is 11%.

as Thing 1 returns profit while thing 2 returns loss here.

d) cost of capital = 14%.
NPV of Thing 1 = (3293 × 2.913) - 10000
= -407.491

NPV of Thing 2 = (14641 × 0.592) - 10000
= -1332.528

NPV of Thing 1 & Thing 2, both are -ve, hence both things incur losses. so **none should be chosen**

e) let cost of capital = 7%.

NPV of thing 1 = $(3293 \times 3.387) - 10000$

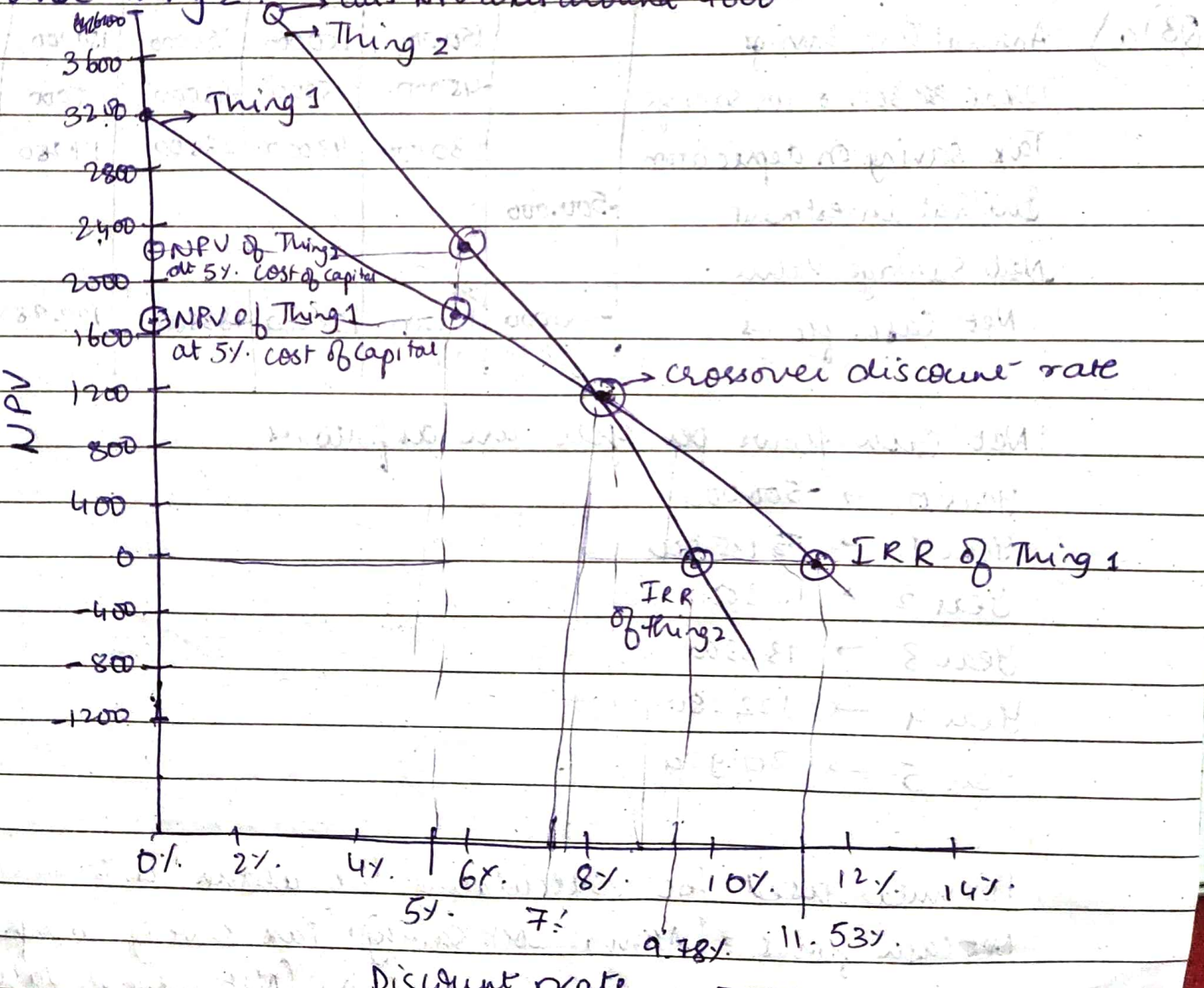
$= 1153.39 \approx 1154$

NPV of thing 2 = $(14641 \times 0.762) - 10000$

$= 1156.4 \approx 1156$

at 7% cost of capital, the NPV's of thing 1 and 2 are almost same. Thus, at this rate, one would be indifferent between choosing Thing 1 and Thing 2.

f)



Q3) a)

	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Annual cost saving		150000	150000	150000	150000	150000
Tax at 30% on cost savings		-45000	-45000	-45000	-45000	-45000
Tax saving on depreciation		30000	48000	28800	17280	17280
Initial investment	-500,000					
Net Salvage Value						78640
Net Cash flows	-500000	135000	153000	133800	122280	200920

Net cash flows per year are as follows

Year 0 → -500000

Year 1 → 135000

Year 2 → 153000

Year 3 → 133800

Year 4 → 122280

Year 5 → 200920

net salvalge value = selling prce -tax on sp +tax gain on reamining value

Formula used for calculating the above is :-

Net Cash flows = (Annual cost saving) + (Tax saving on depreciation) + (Initial investment) + (Net Salvage Value) + (Tax at 30% on cost savings)

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b)

	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net cash flows	-500000	135000	153000	133800	122280	200920
Discount at 10%	1	0.909	0.826	0.751	0.683	0.621
Present value of cash flows	-500000	122727	126446	100526	83519	124756

Net Present Value = -500000 + 122727 + 126446 + 100526 + 83519 + 124756

Net Present Value = 57974 when cost of capital is 10%

c)

	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Cash flows	-500000	135000	153000	133800	122280	200920
Discount at 5%	1	0.952	0.907	0.863	0.822	0.783
Present value of Cash flows	-500000	128571	138776	115581	100600	157426

Net Present Value = -500000 + 128571 + 138776 + 115581 + 100600 + 157426

Net Present Value = 140955 when cost of capital is 5%

d) Profitability Index at 5%.

NPV = 140955, Initial Investment (I_o) = 500,000

$$PI \text{ (Profitability Index)} = \frac{NPV + I_o}{I_o} = 1.28$$

∴ **PI at 5% = 1.28**

e)

	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Cash flow	-500000	135000	153000	133800	122280	200920
Cumulative Cash flow	-500000	-365000	-212000	-78200	44080	245,000

Payback Period = $3 + \frac{78200}{122280} = 3.64$ years

f) Discounted Payback Period at 5%

	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Present Value of Cash flows	-500 000	128 571	138 776	115 581	100 600	157 426
Cumulative " " " "	-500 000	-371 429	-232 653	-117 072	-16 472	140 954

Discounted Payback Period at 5% = $4 + \frac{16472}{157426}$ = **4.104 years**

g) $IRR = X + \frac{P_X - I}{P_X - P_Y}(-X + Y)$

Y = 10%	I_0 = 500 000
X = 5%	

P_{XY} = NPV at 10% + I_0 = 57974 + 500 000 = 55 7954

P_{0X} = NPV at 5% + I_0 = 140954 + 500000 = 640954

~~IRR = 10 + 557954~~

$IRR = 5 + \frac{640954 - 500000}{640954 - 559754}(10 - 5)$

$= 5 + \frac{140954}{81200} \times 5$

IRR = 13.68%

h) MIRR at 5% reinvestment rate

$FV = 200920 + (1.05)122280 + (1.05)^2 133800 + (1.05)^3 153000 + (1.05)^4 135000$

$FV = 200920 + 128394 + 147514.5 + 177116.625 + 164093.3438$

$FV = 818038.4688$

$$MIRR = \sqrt[5]{\frac{818038.4688}{500\,000}} - 1 = 0.10347$$

MIRR = 10.347%.

i) At cost of capital 5%, Mighty Mouse should invest in this robot as the **NPV is positive** in this case.

Also **IRR > cost of capital** and **MIRR > cost of capital**

(Q4)

Building (31.5 year property) ⇒ $400 000
Equipment (5 " ") ⇒ $100 000

After 5 years, building sold at → $350 000
& equipment " " → $50 000

Inventory = $50 000, tax = 30%.

Yr	Sales	Expenses
2004	200,000	100 000
2005	300000	100 000
2006	300000	100 000
2007	300 000	100 000
2008	50 000	20 000

Investment cash flow :-

Asset cost → 50 000
Asset disposition → 50000
Tax effect of Asset disposition → 0

} for inventory

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Asset cost → 400 000
" disposition → 350000
Tax effect of asset disposition → 4047.2
] for Building

Asset cost → 100 000
Asset disposition → 50000
Tax effect of asset disposition → 15000
] for equipment

Operating cash flow

Year	ΔOCF
2004	79809.52
2005	149 809.52
2006	149 809.52
2007	149809.52
2008	30 809.52

Year 2004 → ΔR = 200000 τ = 0.3
ΔE = 100000 ΔD = 20 000 + 12698.4 = 32698.4
ΔOCF = 100 000 x 0.7 + 32698.4 x 0.3 = 79809.52

Year 2005, 2006, 2007 → ΔR = 300 000, τ = 0.3, ΔE = 100000
ΔD = 32698.4 ΔOCF = 149809.52

Year 2008 → ΔR = 50,000 τ = 0.3 , ΔE = 20000
ΔD = 32698.4 , ΔOCF = 30 809.52

Investmental Cash flow

In the begining :- −50,000 − 400 000 − 100000 = **|−$550000**
At the end :- 50000 + 350000 − 4047.2 + 50000 − 15 000
= **$430 952.8**