**EGR 310 Final Exam Study Notes**

**Email version**

**5/1/23**

**1.** One of the major advantages of MACRS is that the "property class lives" are usually less than the "actual useful lives", thus providing a tax advantage early after investment.

**2.** When comparing mutually exclusive investments which all have an IRR above the MARR, economically, the investment with the highest internal rate of return is always preferred over investments with a lower internal rate of return. It is not true.

**3.** Investment size needs to be considered as well. Example. An investment of $10,000 at 7% will yield $700 at the end of a year whereas an investment of $6,000 at 10% will yield $600. The $10,000 investment is preferred.

Consider the following cash flows:

 Cash Flow

0 -$10,000

1 $1,000

2 $2,000

3 $3,000

4 $4,000

5 $5,000

Which equation could you use to compute the IRR?

-$10,000 + $1,000 \* (P/A, i, 5) + $1,000 \* (P/G, i, 5) = ………………..

Break the cash flow into a $1000 annuity and a gradient of $1000.

**4.** The internal rate of return (IRR) is the most frequently used measure in industry because:

It is easy to use and the calculations are not linked to the MARR

**5.** The following equation may be used to compute the internal rate of return:

Answer Key:

 PW of benefits = PW of costs

**6.** XYZ company purchased a machine for the manufacture of springs for $24,000. The useful life of the machine is 8 years, and the salvage value after 8 years is $4,000. If the company uses straight line depreciation, what is the book value at the end of year 3?

Answer Key:

Annual depreciation using straight line depreciation = (cost - salvage value)/(# years useful life) =

Cumulative depreciation after 3 years = 3 \*Annual depreciation = ……..

Book value after 3 years = purchase price - cumulative depreciation = …………….

**7.** A car costs $8,000 and has an anticipated $1,000 salvage value at the end of its five-year depreciable life. Compute the depreciation allowance at the end of year 4 using MACRS (assume a 5-year property class).

Answer Key:

Using MACRS table for 5-year property such as a car, year 4 depreciation is ……….

$8,000 \* ……..= …….

**8.** A piece of construction machinery costs $9,000 and has an anticipated $1,000 salvage value at the end of its five-year depreciable life. Compute the depreciation allowance for the end of year 2 using straight line depreciation.

Answer Key:

(…… cost - …… salvage value)/5 = ……. / year

**9.** What is the depreciation of assets

Answer: Write your definition.

**10.** If you bought a bond above face value, you have bought it at a premium or a discount?

**11.** For a given set of cash flows, when computing the present worth, as the interest rate used goes up, the present worth goes up or down.

**12.** A corporation expects to receive $50,000 each year for 8 years from the sale of a product. There will be an initial investment of $160,000. Manufacturing and sales expenses will be $20,300 per year. Assume straight-line depreciation, an 8-year useful life and no salvage value. Use a 30% income tax rate. Determine the projected after-tax rate of return (use closest rate from table. Do not interpolate.).

Answer Key:

First determine After tax cash flow.

Before tax cash flow per year (BTCF) = income - expenses =……..

Depreciation = $160,000/8 years = …….per year

Taxable amount = BTCF - Depreciation = ………

Tax = 30% of taxable income = 0.3 \* ……= …….

After tax cash flow = BTCF - tax = ……..

Compute Rate of Return

……………= $26,790 \* (P/A, i, 8)

(P/A, i, 8)

i = ……..

**13.** A 10-year bond with the face value of $1,000 and a nominal interest rate of 10% pays interest semi-annually. An investor buys the bond for $1,126.50 with 9 years left until the bond matures and keeps it to maturity. What effective annual rate did the investor receive?

Answer Key:

Interest earned is interest rate (10%) of face value of bond ($1000) = ……/ year.

Paid semi-annually is……. every 6 months.

9 years left to maturity (18 pay periods)

Compute IRR.

$1,126.50 (what investor paid today) = $50 \* (P/A, i, 18) (this is the interest annuity) + $1,000 \* (P/F, i, 18) (gets face value of bond when it matures)

Try 4%:

 $50 \* (……) + $1,000 \* (……) = ……..

Compute effective annual IRR

IRR = (1 + .04)2 - 1 = ………..

**14.** A company is considering investing in a new piece of equipment to reduce the annual costs of producing its products. The new piece of equipment may operate 4 or 5 years. The annual savings may be $40,000, $50,000, or $60,000. The probability for each scenario is given in the following table:

Savings Probability Useful Life Probability

$40,000 0.2 4 yrs 0.8

$50,000 0.7 5 yrs 0.2

$60,000 0.1

What is the joint probability of the investment saving $50,000 for 4 yrs?

Answer Key:

0.7 \* 0.8 = …..%

**15.** A company is considering an investment with the following annual benefits and annual costs with the probability of each:

Annual Benefit Probability Annual Cost Probability

$6,000 70% $4000 50%

$10,000 30% $6,000 30%

 $8,000 20%

a. What is the most likely benefit - cost

b. What is the expected value of Annual Benefit - Annual Cost?

Answer Key:

Annual Benefit Prob Annual Cost Prob Ann Benefit - Cost Joint Prob EV

$6,000 .7 $4,000 .5 $2,000 .35 $700

$10,000 .3 $4,000 .5 $6,000 .15 $900

$6,000 .7 $6,000 .3 $0 .21 $0

$10,000 .3 $6,000 .3 $4,000 .09 $360

$6,000 .7 $8,000 .2 $-2,000 .14 $-280

$10,000 .3 $8,000 .2 $2,000 .06 $120

a. Most likely benefit - cost = …….

b. EV(Benefit - cost) = sum of EV column = ……..

**16.** You are evaluating 2 machines the investment of 2 mutually exclusive machines. Each machine has an eight-year life, and you plan to keep whichever machine you pick for the full 8 years. The cash flows for each machine are summarized in the following table:

 A B

Initial Cost $4,000 $3,000

Annual Benefit $800 $600

Annual Cost $100 $50

Salvage Value $1,500 $1,000

Assuming a 10% MARR and using Incremental Replacement Analysis, which investment should be chosen?

Answer Key:

First compute A - B

Initial cost = $4,000 - $3,000 =…….

Annual Benefit = $800 - $600 = ……

Annual Cost = $100 - $50 = ……

Salvage Value = $1,500 - $1,000 = …….

Using incremental analysis, determine if IRR of difference between A and B is greater than or less than 10% MARR.

Determine NPV of (A - B)

-$1,000 + (200 - 50)(P/A, 10%, 8) + $500(P/F, 10%, 8) =……….

Since NPV is positive, pick larger initial investment A=…….

**17.** Compute the rate of return for the investment represented by the following cash flow (pick closest rate from appendix C. Do not interpolate) (show equation used in book format in your notes):

Year Cash Flow

0 -$2,275

1 +$300

2 +$400

3 +$500

4 +$600

5 +$700

6 +$800

Answer Key:

……. = $300 \* (P/A, i, 6) + $100 \* (P/G, i, 6)

Try 10%: $300 \* (……) + $100 \* (……) = $2,275

IRR =…..

**18.** What is the internal rate of return (IRR) of a $10,000 investment that returns $2,504 per year for 5 years?

Answer Key:

…….. = 2,504\*(P/A, i, 5)

(P/A, i, 5) = ……

From Appendix C, i = ….

**19.** A piece of construction machinery costs $8000 and has an anticipated $1500 salvage value at the end of its five-year depreciable life. Compute the depreciation allowance for the end of year 4 using double declining balance depreciation.

Answer Key:

Year Depreciation Book Value

0 8,000

1 3,200 4,800

2 1,920 2,880

3 1,152 1,728

4 228 1,500

DDB = (2/(number of years))\* BV

For year 4, cannot depreciate below the book value of $1,500. Since there is on $228 left to depreciate, and DDB says to depreciate (2/5)\*1728 = $691.20, depreciate the remaining $228 only.

**20.** A company is considering purchasing a machine for manufacturing that costs $30,000. The salvage value and O&M costs for the next 7 years is given in the following table. The Equivalent Uniform Annual Cost (EUAC) is computed for each year assuming the equipment was sold at the end of that year and a MARR of 6%. What is the optimal economic life of the machine?

Yr Salvage Value O&M Costs EUAC

1 $15,000 $1,200 $18,000

2 $14,400 $2,100 $11,909

3 $13,800 $3,000 $10,753

4 $13,200 $3,900 $10.825

5 $12,600 $4,800 $11,382

6 $12,000 $5,700 $12,178

7 $11,400 $6,600 $13,106

Answer Key :

Optimal economic life occurs when EUAC is a minimum, In this case…… is the minimum EUAC so the optimal economic life is …. years.

**21.** Economic life identifies when an asset maximizes its Equivalent Uniform Annual Cost (EUAC).

Answer Key :

Economic life identifies when an asset minimizes its Equivalent Uniform Annual Cost (EUAC).

**22.** Probabilities are used to better estimate uncertain future cash flows.

**23.** The Tax Cuts and Jobs Act (TCJA) of 2018 reduced the corporate tax rate to a 21% flat rate.

**24.** The Salvage value is not always equals the book value.