I am a graduating senior—circle one: Yes—No

READ THE FOLLOWING GENERAL EXAMINATION RULES:

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I have read and understand all of the above instructions: ____________ (Initials)

Ethical Standards:

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"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam."

________________________
Signature of student

Please do not open this exam until you are told to do so.
Problem 1) Our company will have to purchase a drilling rig if we submit and win a bid for a local city project. The project will last for 10 years. The rig will have an initial cost of $750,000, and a salvage value of $40,000. It will incur an annual maintenance cost of $60,000. Even with annual maintenance, it will start to break down and cost an additional $10,000 for repairs in the 6th year, $20,000 in the 7th year, $30,000 in the 8th, etc. How much should we include for the drill when calculating our costs on this project? Our MARR is 6%.
Problem 1)

\[ F = 40,000 \]
\[ i = 6\% \]
\[ A = 60,000 \]

\[ P = 750,000 \]

\[ S = P - A \left( \frac{P}{A}, i, n \right) \]

\[ \text{Price} = -750 - 60 \times 7,360,0872 - 10 \times 110,4593 - 51,350,7920,0943 + 40 \times 0,558,3953 \]

\[ = -1260,04 \]
Problem 2) For the earlier drill problem, what depreciation will we take in the 4\textsuperscript{th} year? The government classes the drill as 5 year property.
In 4th year by MACRS:
11.52% of $750,000 = $86,400

This comes directly from the F.E.R Reference Manual.

No calculations required.
Problem 3) Calculate the 3\textsuperscript{rd} year depreciation permitted by MACRS for an item classed as 8 year property. Check to see if the value is controlled by double declining balance or straight line depreciation. Your MARR is 6%. Show all required calculations.
Prob 3) Cost = 100% Use mid-year convention
No salvage value

Year 0, value = 100%

At end of first year you get 1/2 year depreciation by double declining method

Deprec Year 1 = 100% \( \left( \frac{1}{8} \right) (2)(\frac{1}{2}) = 12.5\% \)

Book Value after year 1 = 100 - 12.5 = 87.5%

Deprec Year 2 = 87.5% \( \left( \frac{1}{8} \right) (2) = 21.875\% \)

Book Value after 2 = 87.5% - 21.875% = 65.625%

Deprec Year 3 = 65.625% \( \left( \frac{1}{8} \right) (2) = 16.406\% \)

Don't need. Book Value now = 65.625 - 16.406% = 49.219%

Problem to MACRS Depreciation in 2 year
3rd Year
49.219% \( \left( \frac{1}{8} \right) (2) = 12.309\% \)

Straight line depreciation:

3rd Year

Years depreciation remaining = 8 - 2.5 = 5.5
Book Value this year = 69.6363 yd
Straight line Deprec = \( \frac{69.6363}{5.5} \times 6.5 \times 6.67 \)
= 10.10% 

Don't change.
Calculation of MACRS depreciation based on 200% depreciation

Enter number of years in cell F3 ------> **8** year property (Must be <=20 years)

<table>
<thead>
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<th>End of Year</th>
<th>Book Value</th>
<th>200% DB Deprec</th>
<th>Alternate SL Depr</th>
<th>Remaining Life</th>
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Total deduction = **100.00%**

Equations used in calculations:

- \( = 100\% \times \frac{2(B6/F3)}{2} \)
- \( = B6 - F6 \times \frac{2(B7/F3)}{2} = B7/E7 \)
- \( = B7 - F7 \times \frac{2(B8/F3)}{2} = B8/E8 \)
- \( = B8 - F8 \times \frac{2(B9/F3)}{2} = B9/E9 \)

When \( n < 15 \) use \( 2.0 \times \frac{B6/F3}{2} \)

When \( n \geq 15 \) use \( 1.5 \times \frac{B6/F3}{2} \)
Problem 4) Our company is considering two projects. Project A will have an initial cost of $200,000 and a uniform annual profit of $40,000 for 10 years. Project B is a 12 year project and will have an initial cost of $280,000 and a profit starting in the 1st year, of $8,000, $16,000 in the 2nd year, $24,000 in the 3rd year, etc. for a final profit of $96,000 in the 12th year. Which project, if either, should we select if our MARR is 6%?
Prob 4)

(A)

\[ A = \$40 \, k \]

\[ P = 200 \, k \]

\[ E(UAV) = -P \left( A/P, 6\%, 10 \right) + 40 \, k \]

\[ = -200 \left( 0.1359 \right) + 40 \, k \]

\[ = 12.82 \, k/\text{year} \]

(B)

\[ P = 280 \, k \]

\[ E(UAV) = -280 \left( A/P, 6\%, 12 \right) + 8 \left( A/G, 6\%, 12 \right) + 8 \, k \]

\[ = -280 \left( 0.1193 \right) + 8 \left( 4.8113 \right) + 8 \, k \]

\[ = 13.09 \, k/\text{yr} \]
An temporarily move to present:

A) \[ NPW = -200 + 40 \left( \frac{P}{A, 6\%, 10} \right) = 94,403 \]
\[ 7,360,087 \]

B) \[ NPW = -280 + 8 \left( \frac{P}{A, 6\%, 12} \right) + 8 \left( \frac{P}{G, 6\%, 12} \right) \]
\[ 8,383,844 \]
\[ 40,336,860 \]

\[ P \]
\[ 0.135868 \]

A) \[ ANW = 94,403 \left( \frac{A}{P, 6\%, 10} \right) = \$12,826/yr \]

B) \[ ANW = 109,766 \left( \frac{A}{P, 6\%, 12} \right) = \$13,69K/yr \]
\[ 0.119277 \]
Problem 5) How much would you pay for a 10 year, 6% bond with a face value of $10,000 if your MARR is 8%?
10 year 6%  
$10,000

Coupon value = $10,000(0.06) = $600/year
A = $600/yr
n = 10

\[ P = \frac{600}{0.06} \left( \frac{1}{0.06} - \frac{1}{(1 + 0.06)^n} \right) + 10,000 \left( \frac{1}{0.08} - \frac{1}{(1 + 0.08)^n} \right) = 0 \]

\[ P = 8649.06 \]

For MARR = 6%? (not asked)

\[ P = 600 \times (1.73601) + 10,000 \times (0.5584) \]

\[ P = 10,000 - makes\ sense \]
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Signature of student

Please do not open this exam until you are told to do so.
Problem 1) How much would you pay for a 10 year, 8% bond with a face value of $10,000 if your MARR is 6%?
10-year 8% 
$10,000

MARR = 6%

Coupon value = $10,000 \times (0.08) = $800/year

\[ \begin{align*}
A &= $800/yr \\
n &= 10
\end{align*} \]

\[ P = 7.3601 \]

\[ -P + 800 \left[ \frac{P}{A, 6\%, 10} \right] + 10,000 \left[ \frac{P}{F, 6\%, 10} \right] = 0 \]

\[ P = $11,472 \]
Problem 2) Our company is considering two projects. Project A will have an initial cost of $400,000 and a uniform annual profit of $80,000 for 10 years. Project B is a 12 year project and will have an initial cost of $560,000 and a profit starting in the 1st year, of $16,000, $32,000 in the 2nd year, $48,000 in the 3rd year, etc. for a final profit of $192,000 in the 12th year. Which project, if either, should we select if our MARR is 4%?
Prob 2)

(A) 
\[ A = 80^k \]
\[ P = 400^k \]
\[ EUAV = -400 \left( A/P, 4\%, 10 \right) + 80^k \]
\[ = -400 \left( 0.1233 \right) + 80^k \]
\[ = 30.68^k/year \]

(B) 
\[ G = 19,000^k \]
\[ P = 560^k \]
\[ \text{\Phi} \]
\[ 4\% \]
\[ m = 12 \]
\[ EUAV = -560 \left( A/P, 4\%, 12 \right) + 16 \left( A/G, 4\%, 12 \right) + 16^k \]
\[ = 36,85^k/year \]
Problem 3) Calculate the 3rd year depreciation permitted by MACRS for an item classed as 9 year property. Check to see if the value is controlled by double declining balance or straight line depreciation. Your MARR is 8%. Show all required calculations.
Prob 3) Cost = 100% Use mid-year convention
No salvage value

Year 0, value = 100%

At end of first year you get 1/2 year depreciation by double declining method

Deprec Year 1 = 100% \( \left( \frac{1}{9} \right) \left( \frac{2}{12} \right) = 11.1\% \)

Book Value after year 1 = 100 - 11.1 = 88.89%

Deprec Year 2 = 88.89, \( \left( \frac{1}{9} \right) \left( \frac{2}{12} \right) = 19.75\% \)

Book Value after 2 = 88.89 - 19.75 = 69.14

Deprec Year 3 = 69.14 - \( \frac{2}{9} \left( \frac{1}{9} \right) \left( \frac{2}{12} \right) \) = 15.36%

Straight line Depreciation:

3rd Year's depreciation remaining = 9 - 1.5 = 7.5
Book Value this year = 69.14\% / 7.5 yrs
Straight line Deprec = 9.22\% yrs
9.22% < 15.36%

Don't change.
Calculation of MACRS depreciation based on 200% depreciation

Enter number of years in cell F3 -> 9 year property (Must be <= 20 years)

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<tr>
<th>End of Year</th>
<th>Book Value</th>
<th>200% DB</th>
<th>Alternate SL Depr</th>
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Total deduction = 100.00%

Equations used in calculations:

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When n < 15 use 2.0*(B6/F3)/2
When n >= 15 use 1.5*(B6/F3)/2
Problem 4) Our company will have to purchase a large pump if we submit and win a bid for a local city project. The project will last for 10 years. The pump will have an initial cost of $400,000, and a salvage value of $80,000. It will incur an annual maintenance cost of $40,000. Even with annual maintenance, it will start to break down and cost an additional $10,000 for repairs in the 6th year, $20,000 in the 7th year, $30,000 in the 8th, etc. How much should we include for the pump when calculating our costs on this project? Our MARR is 8%.
\[ \Delta F = 80,000 \]

\[ i = 8.9\% \]

\[ A = 40,000 \]

\[ P = 400,000 \]

\[ $= -P - A \left[ \sum_{i} P/A, i, m \right] - G \left[ \sum_{i} P/G, i, m \right] + \left[ \sum_{i} P/F, i, m \right] \]

\[ \text{Price} = -400 - 40 \sum P/A, 8.9\%, 10^3 \]

\[ -10 \sum P/G, 8.9\%, 6 \]

\[ + 80,000 \sum P/F, 8.9\%, 10^3 \]

\[ = -400 - 40 \times 7,101 - 10 \times 523.35 \times 0.7258 \]

\[ + 80 \times 0.4632 \]

\[ = -708.7 \]
Problem 5) For the earlier pump problem, what depreciation will we take in the 4th year? The government classes the pump as 5 year property.
#5) In 4th year by MACRS:
11.52% of $400,000 = $46,080

This value comes directly from the FE Reference Manual.

No calculations required.