General examination rules:

1) Do not put your completed work on a desk or on the floor next to you or anywhere it can be seen by others. If any part of your work can be seen by others it will be confiscated and you will not be permitted to rework those problems. Place it face down on your desk under your existing work.
2) Please remove your hat. If it is part of your head, turn it around backwards.
3) Please believe this: if your work not legible, or if I cannot follow your logic at a glance, or if you use a #9 nail for a pencil with 2 point font, it will receive no credit. This paper will be written to acceptable engineering standards or it will receive no credit.
4) Each problem has the same value.
5) You may work on your own paper or you may use paper supplied at the front of the room.
6) Please read the problem very carefully. Giving the correct answer to something that you weren’t asked is OK, but wasteful of your time.

Ethical Standards:

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

"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 1-1) 25 points. Determine the approximate internal rate of return for the following cash flow: Value 1 = V1 = $100,000, V2 = $10,000 and V3 = $15,000.
Problem 2-1) 25 points. Determine the NPV for the following cash flow: an initial cost of $1200k, a yearly income of $160k/year, and a maintenance cost of $400k every 5 years. Whereas the initial cost is a one time cost, the income and maintenance costs go on forever. Use a MARR of 6%.
Problem 3-1) 25 points. I intend to acquire a dewatering system for my upcoming construction job using one of the following two proposals:

Proposal 1 would involve purchasing a new system from Atwater Corporation at an initial cost of $100,000, and would require a maintenance cost of $10,000/year for the 10 (ten) year life of the system. At the end of 10 (ten) years the system would have a salvage value of $16,000.

Proposal 2 would involve an 8 (eight) year equipment lease from Flowmax. The lease would be a straight yearly lease fee which would include all costs, including maintenance. We are still waiting to receive their final bid which is due within 6 weeks, but their representative has told us it will come in between $20,000 and $25,000 per year. Using break-even analysis and a MARR of 6%, determine if I should bother waiting for their bid or do I already know the answer for what I should do.
Problem 4-1) 25 points. I just handed my banker an $800 check for this month’s house payment. My loan was a 20 year 6% loan and this was the 60th check I have given him. He said that they were currently desperate for cash, and that if I would give him another check to pay off my loan today, the bank would knock 20% off of what I owe them. Sounds like a pretty good deal, but I don’t know if I have that much in the bank.

a) How much did I originally borrow to pay for my house?
b) How much money will I need to pay off the loan at the discount offered? Please note that although you have some of the required interest factor tables to work this problem in your reference manual, they don’t go as far as you need. See the last sheet for additional \( i = 0.5\% \) (hint, hint) values.
General examination rules:

1) Do not put your completed work on a desk or on the floor next to you or anywhere it can be seen by others. If any part of your work can be seen by others it will be confiscated and you will not be permitted to rework those problems. Place it face down on your desk under your existing work.

2) Please remove your hat. If it is part of your head, turn it around backwards.

3) Please believe this: if your work not legible, or if I cannot follow your logic at a glance, or if you use a #9 nail for a pencil with 2 point font, it will receive no credit. This paper will be written to acceptable engineering standards or it will receive no credit.

4) Each problem has the same value.

5) You may work on your own paper or you may use paper supplied at the front of the room.

6) Please read the problem very carefully. Giving the correct answer to something that you weren’t asked is OK, but wasteful of your time.

Ethical Standards:

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

"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 1-2) 25 points. I intend to acquire a dewatering system for my upcoming construction job using one of the following two proposals:

Proposal 1 would involve purchasing a new system from Atwater Corporation at an initial cost of $200,000, and would require a maintenance cost of $20,000/year for the 10 (ten) year life of the system. At the end of 10 (ten) years the system would have a salvage value of $32,000.

Proposal 2 would involve an 8 (eight) year equipment lease from Flowmax. The lease would be a straight yearly lease fee which would include all costs, including maintenance. We are still waiting to receive their final bid which is due within 6 weeks, but their representative has told us it will come in between $40,000 and $50,000 per year. Using break-even analysis and a MARR of 6%, determine if I should bother waiting for their bid or do I already know the answer for what I should do.
Problem 2-2) 25 points. I just handed my banker an $1000 check for this month's house payment. My loan was a 20 year 6% loan and this was the 60th check I have given him. He said that they were currently desperate for cash, and that if I would give him another check to pay off my loan today, the bank would knock 30% off of what I owe them. Sounds like a pretty good deal, but I don't know if I have that much in the bank.

a) How much money will I need to pay off the loan at the discount offered? Please note that although you have some of the required interest factor tables to work this problem in your reference manual, they don't go as far as you need. See the last sheet for additional $i = 0.5\%$ (hint, hint) values.

b) How much did I originally borrow to pay for my house?
Problem 3-2) 25 points. Determine the approximate internal rate of return for the following cash flow: \( V_1 = V_1 = $200,000, V_2 = $20,000 \) and \( V_3 = $36,000 \).
Problem 4-2) 25 points. Determine the NPV for the following cash flow:
an initial cost of $600k, a yearly income of $80k/year, and a maintenance cost of $200k
every 5 years. Whereas the initial cost is a onetime cost, the income and maintenance
costs go on forever. Use a MARR of 6%.
General examination rules:

1) Do not put your completed work on a desk or on the floor next to you or anywhere it can be seen by others. If any part of your work can be seen by others it will be confiscated and you will not be permitted to rework those problems. Place it face down on your desk under your existing work.
2) Please remove your hat. If it is part of your head, turn it around backwards.
3) Please believe this: if your work not legible, or if I cannot follow your logic at a glance, or if you use a #9 nail for a pencil with 2 point font, it will receive no credit. This paper will be written to acceptable engineering standards or it will receive no credit.
4) Each problem has the same value.
5) You may work on your own paper or you may use paper supplied at the front of the room.
6) Please read the problem very carefully. Giving the correct answer to something that you weren’t asked is OK, but wasteful of your time.

Ethical Standards:

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

"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) 25 points. Determine the internal rate of return for the following cash flow:
Value1 = V1 = $100,000, V2 = $10,000 and V3 = $15,000.

\[
G = \frac{5000}{g} = 555.56
\]

\[
-100000 + 10000 \left[ \frac{1 - (1 + g)^{-10}}{g} \right] + 555.56 \left[ \frac{1 - (1 + g)^{-8}}{g} \right] = 0
\]

Try 6%:

\[
-100000 + 10000 \left[ 7.3601 \right] + 555.56 \left[ 29.6023 \right] = -9953
\]

Try 4%:

\[
-100000 + 10000 \left[ 8.1109 \right] + 555.56 \left[ 33.8814 \right] = -67
\]

Close enough — 4%
Quiz A Version 1 Problem 2

Problem 2-1) 25 points. Determine the NPV for the following cash flow: an initial cost of $1200k, a yearly income of $160k/year, and a maintenance cost of $400k every 5 years. Whereas the initial cost is a one time cost, the income and maintenance costs go on forever. Use a MARR of 6%.

\[ A = 160 \]
\[ i = 6\% \]
\[ n = \infty \]
\[ 1200 \]
\[ 400 \]
\[ 400 \]
\[ A = 70.96 \]
\[ A = 400 \left[ \frac{F}{A, 6\%, 5} \right] = 0.1774 \]
\[ A = 70.96 \]

\[ NPC = -1200 - \left[ \frac{70.96}{.06} \right] = -1200 - 1182.67 = -\$2382.67 \]
\[ NPB = \frac{160}{.06} = \$2,666.67 \]

\[ NPC = -\$2382.67 \]
\[ NPB = \$2,666.67 \]

\[ NPV = NPB - NPC = 2666.67 - 2382.67 \]
\[ NPV = \$284k \]

Stolen from a student.
Problem 2) 25 points. Determine the NPV for the following cash flow: an initial cost of $1200k, a yearly income of $160k/year, and a maintenance cost of $400k every 5 years. Whereas the initial cost is a one time cost, the income and maintenance costs go on forever. Use a MARR of 6%.

\[
\begin{align*}
\text{Change 400 to equivalent A:} \\
\frac{400}{\sum_{i=0}^{4} F/A, 6\%, 5} & = 70,958 \\
so \quad A = \frac{400}{5.6371} = 70,958 \\
\text{So original problem converts to} \\
1200k & = 160k + 70,958k \\
& = 89.04k \\
\text{So NPV} = -1200k + \frac{89.04k}{0.06} \\
& = +284k
\end{align*}
\]
Quiz A Version 1 Problem 3

Problem 3-1) 25 points. I intend to acquire a dewatering system for my upcoming construction job using one of the following two proposals:

Proposal 1 would involve purchasing a new system from Atwater Corporation at an initial cost of $100,000, and would require a maintenance cost of $10,000/year for the 10 (ten) year life of the system. At the end of 10 (ten) years the system would have a salvage value of $16,000.

Proposal 2 would involve an 8 (eight) year equipment lease from Flowmax. The lease would be a straight yearly lease fee which would include all costs, including maintenance. We are still waiting to receive their final bid which is due within 6 weeks, but their representative has told us it will come in between $20,000 and $25,000 per year. Using break-even analysis and a MARR of 6%, determine if I should bother waiting for their bid or do I already know the answer for what I should do.

Stolen from a student.

Proposal 1 - Purchase

\[ \frac{16,000}{A} = 10 \]
\[ i = 6\% \]
\[ 7.3601 \]
\[ A = 16,000 \frac{\alpha_{PA}}{i} \]
\[ NW\text{C} = -100,000 - 10,000 \frac{\alpha_{PA}}{i} + 16,000 \frac{\alpha_{PF}}{i} \]
\[ NW\text{C} = -16,466.67 \]
\[ \rightarrow \text{Turn into annual: } A = 16,466.67 \frac{\alpha_{PA}}{i} - 0.1359 \]
\[ A = \$23,378.3 \text{ year for Proposal 1} \]

Proposal 2 - Lease

\[ n=8 \]
\[ A_d = ? \]

Using the break even analysis, it can be seen that for proposal 2 to cost as much as Proposal 1, then it would need to be above $23,378.3. If they claim the bid will be between $20,000 - $25,000, then it is well worth the wait for their offer because it will be cheaper.

\[ 23,378.3 \frac{\alpha_{PA}}{i} = A_d \frac{\alpha_{PA}}{i} \]
\[ A_d < 23,378.3 \text{ year to be a better offer.} \]
Problem 3) 25 points. I intend to acquire a dewatering system for my upcoming construction job using one of the following two proposals:

Proposal 1 would involve purchasing a new system from Atwater Corporation at an initial cost of $100,000, and would require a maintenance cost of $10,000/year for the 10 (ten) year life of the system. At the end of 10 (ten) years the system would have a salvage value of $16,000.

Proposal 2 would involve an 8 (eight) year equipment lease from Flowmax. The lease would be a straight yearly lease fee which would include all costs, including maintenance. We are still waiting to receive their final bid which is due within 6 weeks, but their representative has told us it will come in between $20,000 and $25,000 per year. Using break-even analysis and a MARR of 6%, determine if I should bother waiting for their bid or do I already know the answer for what I should do.
Project 1

\[\begin{align*}
-100,000 \sum_{n=0}^{10} \frac{1}{(1.06)^n} + 10,000 \sum_{n=6}^{10} \frac{1}{(1.06)^n} &= -A \\
A &= 100,000 \left( \frac{1 - (1.06^{-11})}{0.06} \right) + 10,000 - 16,000 \left( \frac{1 - (1.0759^{10})}{0.0759} \right) \\
&= \$22,375.60/\text{year}
\end{align*}\]

Project 2

Since cost is between $20,000 and $25,000, I have proposal before deciding. I must wait for proposal before deciding.
Quiz A Version 1 Problem 4

Problem 4-1) 25 points. I just handed my banker an $800 check for this month's house payment. My loan was a 20 year 6% loan and this was the 60th check I have given him. He said that they were currently desperate for cash, and that if I would give him another check to pay off my loan today, the bank would knock 20% off of what I owe them. Sounds like a pretty good deal, but I don't know if I have that much in the bank.

a) How much did I originally borrow to pay for my house?

b) How much money will I need to pay off the loan at the discount offered? Please note that although you have some of the required interest factor tables to work this problem in your reference manual, they don't go as far as you need. See the last sheet for additional $i = 0.5\%$ (hint, hint) values.

\[ i = 0.5\% \]

\[ A = 800 \]

\[ n = 60 \]

\[ i = 0.5\% \]

\[ p + 800 \left[ \frac{p}{A}, 0.5\%, 60 \right] = 0 \]

\[ p = 800 \left[ 139.580712 \right] \]

\[ p = \$111,665 \rightarrow \text{initial cost of house} \]

\[ F = \$94,799.7 \text{ (what's left on loan)} \]

\[ x \cdot 0.8 \]

\[ \$75,839.8 \]
Quiz A Version 1 Problem 4

Problem 4) 25 points. I just handed my banker an $800 check for this month’s house payment. My loan was a 20 year 6% loan and this was the 60th check I have given him. He said that they were currently desperate for cash, and that if I would give him another check to pay off my loan today, the bank would knock 20% off of what I owe them. Sounds like a pretty good deal, but I don’t know if I have that much in the bank. How much money will I need to pay off the loan? Please note that although you have some of the required interest factor tables to work this problem in your reference manual, they don’t go as far as you need. See the next sheet for additional 0.05% (hint, hint) values.
Quiz A Version 1 Problem 4

\[ P - P + A \varepsilon P A, 0.005, 240 \frac{1}{3} = 0 \]
\[ P = 800 \\overline{\varepsilon 1 3 9.5807723} = \underline{111,665} \]

\[ -P + A \varepsilon P A, 0.005, 240 \frac{1}{3} + F \varepsilon P F, 0.005, 240 \frac{1}{3} = 0 \]
\[ P = 94,799 \text{ with } 0.8 = \underline{75,839} \]
or could solve:

\[ 20 \text{ yrs} \times \frac{12 \text{ mo}}{\text{ yr}} = 240 \text{ mo} \]

\[ 240 - 60 = 180 \text{ left} \]

\[-P + 800e^{0.005 \times 180} = 0\]

\[ P = 800 	imes 1.185035153 \]

\[ = 94,802 \]

So pay \(0.8(94,802) = 75,842\)
Problem 1) 25 points. I intend to acquire a dewatering system for my upcoming construction job using one of the following two proposals:

Proposal 1 would involve purchasing a new system from Atwater Corporation at an initial cost of $200,000, and would require a maintenance cost of $20,000/year for the 10 (ten) year life of the system. At the end of 10 (ten) years the system would have a salvage value of $32,000.

Proposal 2 would involve an 8 (eight) year equipment lease from Flowmax. The lease would be a straight yearly lease fee which would include all costs, including maintenance. We are still waiting to receive their final bid which is due within 6 weeks, but their representative has told us it will come in between $40,000 and $50,000 per year. Using break-even analysis and a MARR of 6%, determine if I should bother waiting for their bid or do I already know the answer for what I should do.
Quiz A Version 2 Problem 1

Project 1

\[ \begin{align*}
200,000 & \quad m = 10 \\
32,000 & \\
\end{align*} \]

\[ \begin{align*}
-200,000 \left( \frac{S_A}{P} \right) 6\% & \times 10^5 = -20,000 + 32,000 \left( \frac{A}{F} \right) 6\%, 10^5 \\
A & = 200,000 \times 0.13593 + 20,000 - 32,000 \times 0.07593 \\
& = 44,751.20 \text{ / year}
\end{align*} \]

Project 2

Since cost is between $40,000 and $50,000, have to wait for proposal before deciding.

\[ \begin{align*}
0 & \quad m = 8 \\
\begin{array}{c}
\hline
\hline
\hline
\hline
\hline
\hline
\hline
\hline
\hline
\hline
\hline
\end{array}
\end{align*} \]

$40,000 \leq A \leq 50,000$
Quiz A Version 2 Problem 2

Problem 2-2) 25 points. I just handed my banker an $1000 check for this month's house payment. My loan was a 20 year 6% loan and this was the 60th check I have given him. He said that they were currently desperate for cash, and that if I would give him another check to pay off my loan today, the bank would knock 30% off of what I owe. Sounds like a pretty good deal, but I don't know if I have that much in the bank. Stolen from a student.

a) How much money will I need to pay off the loan at the discount offered? Please note that although you have some of the required interest factor tables to work this problem in your reference manual, they don't go as far as you need. See the last sheet for additional i = 0.5% (hint, hint) values.

b) How much did I originally borrow to pay for my house?

\[ P = 1000 \left( \frac{P}{A, \frac{6}{12}, 360} \right) \]

\[ P = 1000 \left( \frac{1.398576}{1.06} \right) \]

\[ P = \$139,581 \]

\[ P = \$139,581 \left( \frac{6}{12} \right) \]

\[ F = 139,581 \left( \frac{60}{1.06} \right) = 1000 \left( \frac{1.06^{30}}{1.06} \right) \]

\[ F = 118,511 \]

\[ \$329,571.60 \] (check amount)

\[ \text{Check} = 118,511(0.7414) + 1000(51.7256) \]
Problem 2-2) 25 points. I just handed my banker an $1000 check for this month’s house payment. My loan was a 20 year 6% loan and this was the 60th check I have given him. He said that they were currently desperate for cash, and that if I would give him another check to pay off my loan today, the bank would knock 30% off of what I owe them. Sounds like a pretty good deal, but I don’t know if I have that much in the bank.

a) How much money will I need to pay off the loan at the discount offered? Please note that although you have some of the required interest factor tables to work this problem in your reference manual, they don’t go as far as you need. See the last sheet for additional i = 0.5% (hint, hint) values.

b) How much did I originally borrow to pay for my house?

\[
P_{240} = A \left(P/A, 0.5\%, 240\right)
\]
\[
A = 1000 \\
240 = n
\]
\[
1000 \left(13.5\%\right) = P = \$139,580
\]

\[
P_{180} = A \left(P/A, 0.5\%, 180\right)
\]
\[
l = 0.5 \\
n = 180
\]
\[
1000 \left(13.5\%\right) = P = \$118,500
\]

You currently owe

IF DISCOUNT TAKEN OFF OF CURRENT LOAN
YOU WOULD ONLY NEED PAY 70% OF $118,500 WHICH
IS $82,950.

b) You originally borrowed $139,580.
Quiz A Version 2 Problem 2

\[ P = 1000 \] 
\[ A = 1000 \]
\[ m = 20 \times 12 = 240 \text{ months} \]

\[ -P + A \sum P, 0, 005, 2.403 \] \[ = 0 \]
\[ P = 1000 \sum 3.9, 580, 772, 8 \] \[ = 139, 580.77 \]

\[ -P + A \sum P, 0.05, 603 \] \[ + F \sum F, 0.74143 \] \[ = 0 \]
\[ 139, 580.77 \] \[ -139, 580 + 1000 \sum 51.725, 63 \] \[ + F \sum 0.74143 \] \[ = 0 \]
\[ F = 118, 499 \text{ (times 0.7 = 82, 949) } \]
or could solve:

\[ P + 1000e^{-\frac{12}{180}} = 0 \]

\[ P = 1000 \times 118.503515 \]

\[ = 118,504 \]

So pay 0.7(118,504) = $82,953
Problem 3) 25 points. Determine the internal rate of return for the following cash flow:
Value 1 = V1 = $100,000, V2 = $10,000 and V3 = $18,000.

\[ G = \frac{18^K - 10^K}{9} = 0.889^K \]

\[ -100,000 + 10,000 \times 0.5417 \times 10^3 + 888.88 \times 29,602.35 \times 10^3 = 0 \]

Try 6%:

\[ -100,000 + 10,000 \times 7,36017 + 888.88 \times 29,602.35 \]

\[ = -86 \]

Close enough

6%
Quiz A Version 2 Problem 4

Problem 4) 25 points. Determine the NPV for the following cash flow:
an initial cost of $600k, a yearly income of $80k/year, and a maintenance cost of $200k
every 5 years. Whereas the initial cost is a one-time cost, the income and maintenance
costs go on forever. Use a MARR of 6%.

\[
A = 80k
\]

\[
600k
\]

Change $200k to an A

\[
-200 = -A \cdot F/A, 6\%, 5
\]

\[
A = \frac{200}{5.6371} = 35.479
\]

So problem converts to

\[
A = 80
\]

\[
A = 35.479
\]

So NPV = $-600 + \frac{44.521}{0.06}k

= 142k