**ENGR 122 EXAM 2 Name: _____**

**Closed book, closed notes.**

*Honor Statement*: On my honor, I promise that I have not received any outside assistance on this exam (I didn't look at another student's paper, I didn't view any unauthorized written materials, I didn't talk or listen to another student). I also promise not to discuss the exam with students in other sections until after all sections have taken the exam.

_____signature

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$P = F(1 + i)^{-n}$ $F = A\left[\frac{(1+i)^n - 1}{i}\right]$ $P = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$

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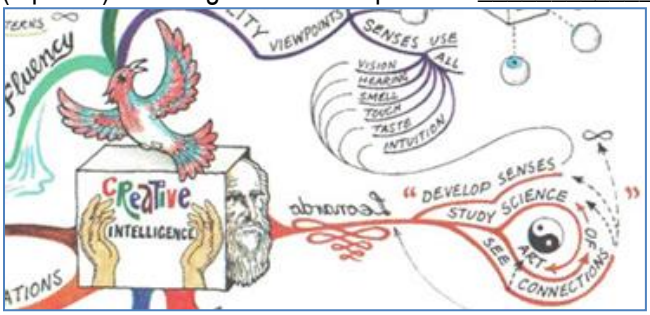
1. (5 points) The diagram below is part of a _____.

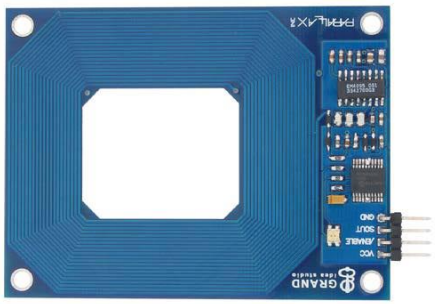



2. (4 points) The tool used in class to bend sheet metal when making the name plate in class is called a _____. The machine used actually has three parts; we are only asking for the name of the device that bends the metal.

3. (4 points) List four of the five steps of the IDEO process:
   a. _____ c. _____
   b. _____ d. _____

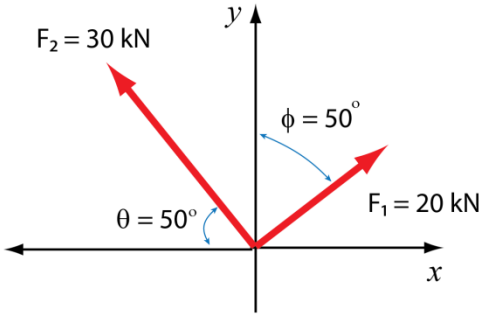
4. (3 points) What global and societal issue did you write a short paper about this quarter (since the midterm?)

5. (4 points) The picture below shows what type of sensor?

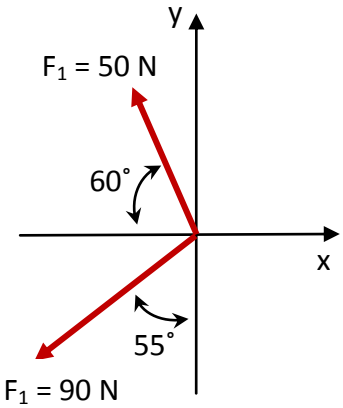


6. (5 points) When learning about brainstorming, we discussed vertical and lateral thinking. Describe lateral thinking.

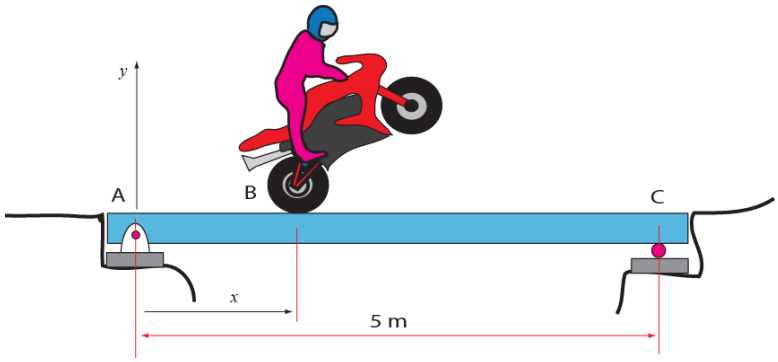
7. (5 points) The magnitude of the y-component of $F_2$ is closest to . . .
   (a) 8.1 kN
   (b) 12.7 kN
   (c) 19.3 kN
   (d) 21.3 kN
   (e) 23 kN



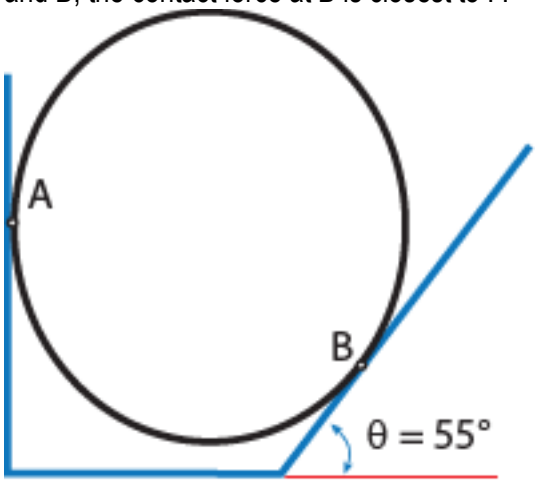

8. (5 points) The resultant of the force system shown below is closest to . . .
   (a) 62.1 lbs
   (b) 86.9 lbs
   (c) 99.1 lbs
   (d) 109 lbs
   (e) 140 lbs



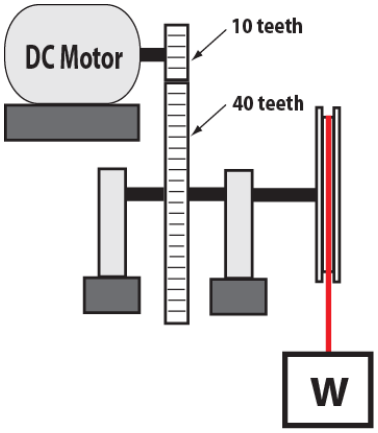
9. (5 points) Assume a motorcycle of unknown weight drives at constant speed across a smooth bridge. If the distance x is 1m and the reaction at C is 1000 N upward, then the vertical reaction at A (neglecting the weight of the beam itself) is closest to . . .
   (a) 1000 N
   (b) 2000 N
   (c) 3000 N
   (d) 4000 N
   (e) 5000 N
   (f) 6000 N



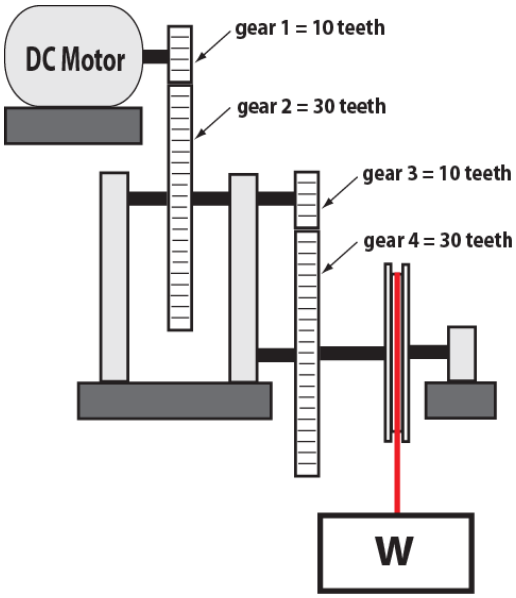

10. (5 points) A circular barrel of weighing 10kN is wedged in a crack as shown. Assuming frictionless contact at points A and B, the contact force at B is closest to . .
   (a) 12.7 kN
   (b) 17.4 kN
   (c) 21.9 kN
   (d) 24.4 kN
   (e) 26.8 kN



11. (5 points) A 100 N weight, W, is lifted by a pulley with a radius of ½ m that makes one complete turn every second (1 revolution/sec or 60 RPM). Assuming the motor requires 800W of electrical power, the efficiency of the electric motor / gear train system is closest to . . .
    (a) 39.3%
    (b) 45.3%
    (c) 78.5%
    (d) 86.6%
    (e) 90.0%




12. (5 points) If the DC motor outputs a torque of 10 in-lbs, then the torque transmitted to the pulley which lifts the weight W is closest to . . .
    (a) 10 in-lbs
    (b) 30 in-lbs
    (c) 50 in-lbs
    (d) 70 in-lbs
    (e) 90 in-lbs



12. (5 points) A Tech engineering professor offered to loan one of his students $100 at the beginning of the spring quarter. He charged the student 3% interest per week with the interest being compounded weekly. If the entire loan comes due at the end of the 10-week long spring quarter, then the amount of money that the student owes the professor at the end of the quarter is closest to . . .

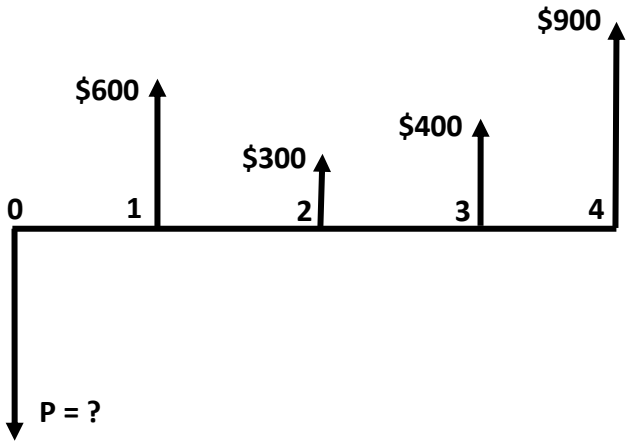
(a) $100
(b) $134
(c) $153
(d) $178
(e) $300

13. (5 points) Assume you have a time machine and travel back to the year 1492 to make a deposit in a bank that will earn 2% interest per year (compounded annually) until the money is withdrawn. If you wanted to suddenly receive $1,000,000 in the year 2010, then the amount of money that you would have had to deposit back in 1492 is closest to . . .

(a) $35
(b) $125
(c) $193
(d) $1,930
(e) $3,500

14. (5 points) Given the cash flow diagram shown below and assuming an annual interest rate of 9% compounded yearly, the total present worth of the dollar amounts is closest to:

(a) $1,635
(b) $1,749
(c) $1,935
(d) $2,035
(e) $2,335



15. (5 points) A recent Tech engineering graduate is about to buy her first house. She thinks she can afford to pay $600 per month for the principal, interest and other costs. If the bank allows her to repay the loan over a 30-year period with an interest rate of 6% each year, compounded monthly, then what is the maximum price of the home she can afford?

(a) $75,000
(b) $100,000
(c) $150,000
(d) $216,000
(e) $250,000

16. (5 points) If you deposit $100 per month in an account that earns 7% annually, the number of months that it will take you to save $10,000 (assuming monthly compounding) is closest to:

(a) 60 months
(b) 80 months
(c) 100 months
(d) 120 months
(e) 140 months

17. (5 points) 3. A family friend has offered you some money. They will let you decide between two options for receiving the money. In either case, you have decided to invest the money with a company that guarantees you an annual interest rate of 6% compounded monthly and you will withdraw all of the money in the account in 10 years.
**Option 1** is to receive a lump sum payment of $8,000 right now and then invest it for 10 years.
**Option 2** is to receive a monthly payment of $100 for ten years and invest it as you get it.

At the end of the 10 year period, the difference between the two options is closest to:

(a) $303
(b) $1,830
(c) $2,180
(d) $2,490
(e) $3,910

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*Please raise your hand after finishing each problem.*

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(15 points) You have decided to invest $35,000 into a business opportunity that is expected to earn an average return of 8% annually over the life of the investment. Create a table showing the value of the investment at the end of each year over a 35 year period. You must MANUALLY generate the table using the formulas from class (not built-in Excel functions). The table should have the columns below:

| year | end-of-year investment value |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| **(up to 35 yrs)** | |

☐ **(7 points)** An Excel spreadsheet showing investment value was generated using class formulas.

☐ **(8 points)** The investment value at the end of the investment period is $_____.

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---

(15 points) You have decided to invest $30,000 into a business opportunity that is expected to earn an average return of 7% annually over the life of the investment. Create a table showing the value of the investment at the end of each year over a 35 year period. You must MANUALLY generate the table using the formulas from class (not built-in Excel functions). The table should have the columns below:

| year | end-of-year investment value |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
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(15 points) You have decided to invest $25,000 into a business opportunity that is expected to earn an average return of 6% annually over the life of the investment. Create a table showing the value of the investment at the end of each year over a 35 year period. You must MANUALLY generate the table using the formulas from class (not built-in Excel functions). The table should have the columns below:

| year | end-of-year investment value |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| **(up to 35 yrs)** | |

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☐ **(8 points)** The investment value at the end of the investment period is $_____.