

ENGR 122 EXAM 2 Name: _____

- Closed book, closed notes.
- You must show all of your work, with units, to receive credit.
- Credit will not be given for multiple choice questions that have the correct answer circled but do not have matching work that leads to the answer.

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.

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$$I = Pni$$

$$F = P(1 + ni)$$

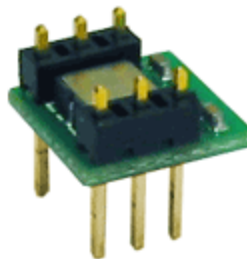
$$F = P(1 + i)^n$$

$$P = F(1 + i)^{-n}$$

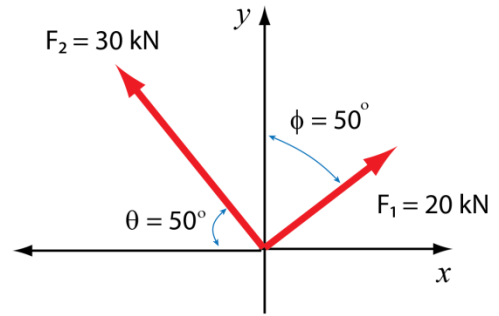
$$F = A \left[\frac{(1+i)^n - 1}{i} \right]$$

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

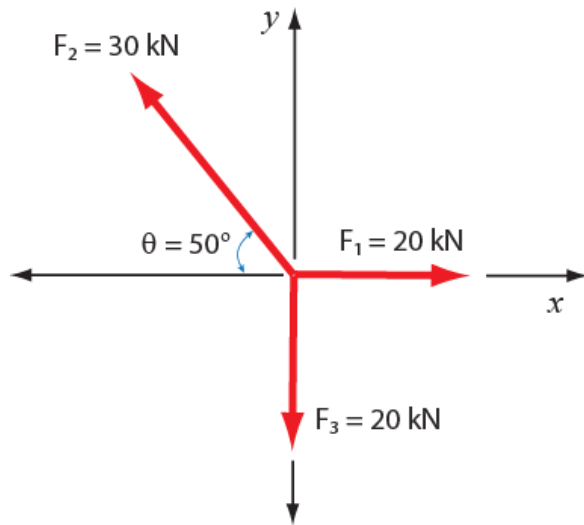
1. (4 points) In ENGR 122, we followed a design methodology defined by a four letter acronym. What are the letters? _____
2. (4 points) The tool used in class to permanently join two pieces of sheet metal is called a _____.
3. (4 points) When learning about brainstorming, we discussed different ways of "thinking" that were important at different stages of the brainstorming process. _____ thinking doesn't worry about right or wrong, jumps around and tries to expand possibilities; _____ thinking is sequential, analytical, excludes irrelevant material and tries to finalize.
4. (4 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 (two models of the same type of sensor are shown)?



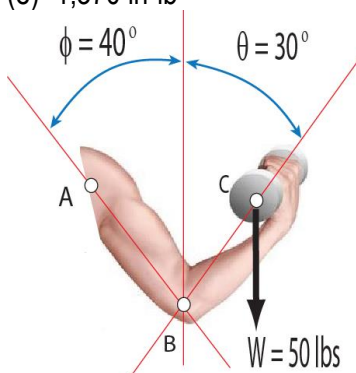
6. (5 points) The magnitude of the y-component of F_1 is closest to . . . (notice that ϕ is measured relative to the y-axis)
- (a) 8.1 kN
 - (b) 10.7 kN
 - (c) 12.9 kN
 - (d) 21.3 kN
 - (e) 23 kN



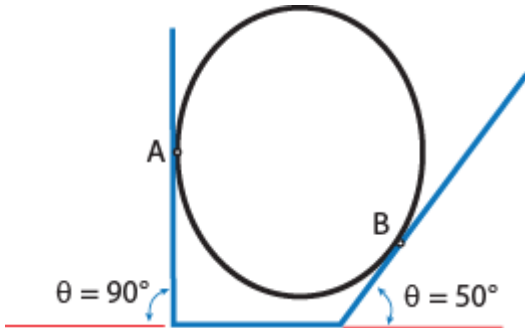
7. (5 points) The x-component of the resultant for the force system shown below is closest to . . .
- (a) -1.3 kN
 - (b) 0.0 kN
 - (c) 0.7 kN
 - (d) 1.3 kN
 - (e) 3.8 kN



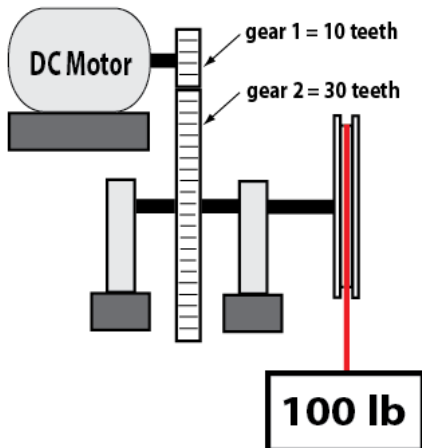
8. (5 points) If the distance between points A and B is 13 inches and the distance between points B and C is 10 inches, then the moment that the 50 lb. force makes about point A is closest to . . .
- (a) 167 in-lb
 - (b) 668 in-lb
 - (c) 710 in-lb
 - (d) 970 in-lb
 - (e) 1,370 in-lb



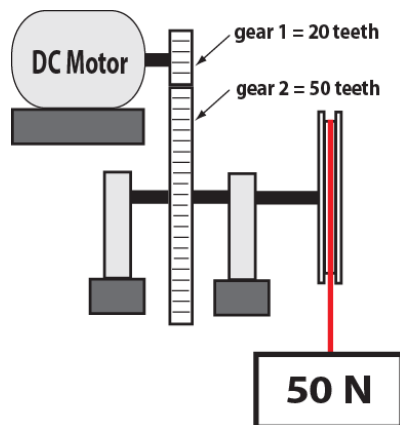
9. (5 points) A circular barrel of unknown weight is wedged in a crack as shown. Assume frictionless contact at points A and B. If the contact force at A is 100 lbs, then the weight of the barrel is closest to .
- (a) 27.0 lbs
 - (b) 83.9 lbs
 - (c) 111.4 lbs
 - (d) 128.6 lbs
 - (e) 203.7 lbs



10. (5 points) A 100 lb weight is lifted by a pulley with a radius of 10 inches that makes one complete turn every 3 seconds. Assuming the motor and gear train have an efficiency of 90%, the RPM of the DC motor is closest to . . .
- (a) 10 RPM
 - (b) 20 RPM
 - (c) 30 RPM
 - (d) 40 RPM
 - (e) 50 RPM
 - (f) 60 RPM
 - (g) 120 RPM



11. (5 points) A 50 N weight is lifted by a pulley with a diameter of 1m that makes one complete turn every second. Assuming the motor and gear train have an efficiency of 80%, the DC power that must be delivered to the DC motor is closest to . . . :
- (a) 196 W
 - (b) 393 W
 - (b) 453 W
 - (c) 785 W
 - (d) 5,000 W
 - (e) 6,777 W



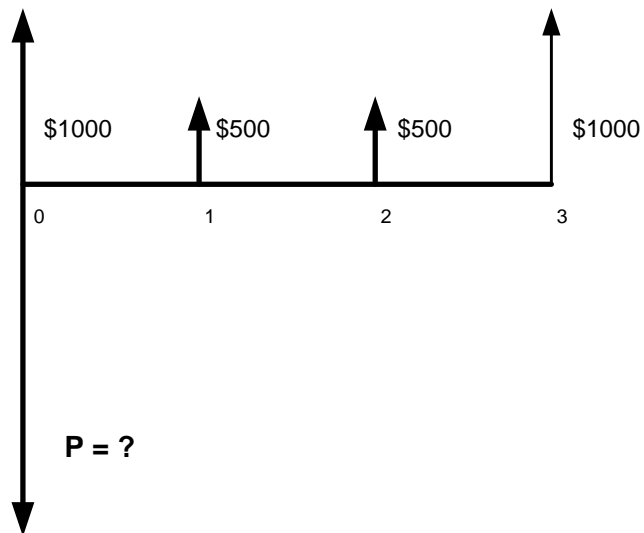
12. (5 points) You convince your bank to loan you \$1000 as a simple interest loan. If the interest rate is 2% per month, how much do you owe after a year?
- (a) \$1000
 - (b) \$1240
 - (c) \$1268
 - (d) \$1295
 - (e) Not enough information to solve problem
13. (5 points) You convince your bank that you will pay them \$10,000 in five years if they offer you terms of a simple interest loan. If the interest rate is 5% per year, how much will you be able to borrow today?
- (a) \$5,000
 - (b) \$6,139
 - (c) \$7,524
 - (d) \$8,000
 - (e) \$10,000

14. (5 points) You want to buy a new TV from Hall Hardware that costs \$900 today. If the company offers you a 6 month loan at 0% interest and does not require you to put any money down today, then at the end of 6 months you will owe . . .
- (a) \$0
 - (b) \$900
 - (c) \$927
 - (d) \$954
 - (e) \$1,008

15. (5 points) If you deposit \$100 per month into a savings account over a 5 year period at 5% annual interest (compounded monthly), the amount of money you will have after 5 years is closest to . . .
- (a) \$100
 - (b) \$1,000
 - (c) \$2,500
 - (d) \$4,800
 - (e) \$6,800

16. (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) \$0
- (b) \$2,650
- (c) \$3,000
- (d) \$3,250
- (e) \$3,430
- (f) \$5,000



17. (5 points) You are ready to buy your first house. Currently, 30-year mortgage rates are 4%, compounded monthly. If you feel you can spend \$1500 per month to pay the loan, the maximum amount you can afford to pay for a home today will be closest to:

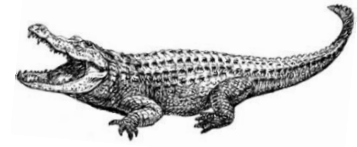
- (a) \$45,000
- (b) \$100,000
- (c) \$250,000
- (d) \$314,000
- (e) \$540,000
- (f) \$832,000

18. (5 points) If you deposit \$50 per month in an account that earns 8% annually, the number of months that it will take you to save \$10,000 (assuming monthly compounding) is closest to:

- (a) 0 months
- (b) 11 months
- (c) 22 months
- (d) 33 months
- (e) 44 months
- (f) 55 months
- (g) 66 months
- (h) 91 months
- (i) 128 months

19. (5 points) You have decided to start an alligator farm so that you can rent alligators for birthday parties, weddings, etc. You will buy 10 baby alligators at \$500 each today. The alligators will require 7 years to achieve full growth, at which time you can start renting them. It will cost an average of \$150 each month to feed each alligator; however, you can make \$2,000 on each alligator for rental for each month of the 5 years of their adult lives. (Due to harsh working conditions, they only have a life span of 12 years.) What is the overall value of this investment in today's dollars? (Hint: it will be the present value of the rental income minus the present value of all your costs.) Assume interest rates are 6% annually (compounded monthly) for the entire project, and that there is no salvage value from the alligators at the end of their 12-year life span.)

- (a) -\$158,391
- (b) -\$15,000
- (c) \$0
- (d) \$72,043
- (e) \$289,959
- (f) \$521,722
- (g) \$785,210
- (h) \$1,293,832



Computer Portion: Allowed materials include calculator and computer, pen or pencil.

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, my network connectivity was not turned on, . . .).

_____ signature

Please raise your hand after finishing each problem.

$$I = Pni$$

$$F = P(1 + i)$$

$$P = \frac{F}{1+i}$$

$$F = P(1 + i)^n$$

$$P = F(1 + i)^{-n}$$

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

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

You just learned that you have a genetic defect that causes you to age very slowly, resulting in an expected lifetime of 500 years. Consequently, time is on your side when it comes to investments. If you invest \$5 now instead of spending it on a coffee at Starbucks, how many years will it take for you to become a millionaire? Assume you can earn an annual percentage rate of 5% compounded annually.

For this problem, create a spreadsheet showing the value of your account each year up until the time that your investment exceeds \$1,000,000. You must use cell formulas to receive credit (not just type numbers in the cells), and your spreadsheet must have the columns shown below. Write your answer in the blank below (use an integer for the year).

Years to become a millionaire = _____

Year	Beginning of Year Value	Interest Earned this Year	End of Year Value
1	\$5	\$0.25	\$5.25
2			
3			
4 (and so on)			

(5 points) Show your instructor an Excel spreadsheet like the one above. Show your instructor the top of the spreadsheet, and then scroll down to the bottom to show the final answer.

(5 points) The number of years to become a millionaire is correct.