

This HW will help you understand the material we covered in class, and give you a feeling about midterm exam problems. The HW has two parts, (1) study and working in engineering fields, and (2) Octave as a computational tool of great added value to engineering students

Part 1.

1. Your company has been granted a contract to develop the next generation of electronic cigarette, also known as a “nicotine delivery system,” and you have been assigned to the design team. Can you in good conscience contribute your expertise to this project? Write in details: issues, stakeholders, consequences action you might take.
2. Choose **one** of the following industries then:
 - a. Apply the four-step ethical decision-making procedure to gain insight into the nature of the decision to be made
(what the issue and who is effected by the alterntives, alternatives from other prespectives and their correlation, suggest an action)
 - b. Give at least one more ethical issue in the indutry you choose

Choose one:

Food processing industry (one issue Excess use of (fat/sugar/salt))

International manufacturing companies (one issue poor labor practice in other countries)

Various chemical industries (one issue Pesticide effect on ecosystem)

3. For a 14 minutes oral presentation, how would you allocate the time for introduction, body and conclusion
List some recommendations related to oral presentations
List some body language related aspects of oral presentation
4. Fix the following texts to look more professional
 - The manager at the company discussed the project of the construction with the engineer of the contract.
 - Mechanical engineers designed vehicles, develop heating system, and drawing machine parts
 - The following skills are used by engineers analysis creativity and communication
5. What are the steps in designing a solution to a problem?
What are the constraints faced in designing solution for engineering problems?
6. An engineer works at an automobile manufacturing facility. His tests show that there is 1% probability that the brake system might fail. He informs his manager of his findings. However, his manager stresses the importance of shipping the new automobiles on time because any more delays in production will cause massive financial losses. He asks the engineer to ignore the test results and concentrate on meeting the delivery deadlines.
7. Choose and explain your choice of major, and the type of job you envision yourself doing in 15 years. Consider the following:
 - (a) What skills or talents do you possess that will help you succeed in your field of interest?
 - (b) How passionate are you about pursuing a career in engineering? If you do not plan on being an engineer, what changed your mind?
 - (c) How confident are you in your choice of major?
 - (d) How long will it take you to complete your degree?
 - (e) Will you obtain a minor?
 - (f) Will you pursue study abroad, co-op, or internship?
 - (g) Do you plan to pursue an advanced degree, or become a professional engineer (PE)?
 - (h) What type of work (industry, research, academic, medical, etc.) will you pursue?
8. Read the essay “Engineering is an . . . itch!” in the Engineering Essentials introduction. (chapter 1) Reflect on what it means to have performance-focused versus mastery-focused learning goals.
 - (a) Describe in your own words what it means to be a performance-based learner compared with a mastery-based learner.

(b) What learning goals do you have? Are these goals performance based or mastery based?

(c) Is it important to you to become more mastery focused?

(d) Do you have different kinds of learning goals than you had in the past, and do you think you will have different learning goals in the future?

9. Determine the density and specific gravity of a rock.

10. Choose a topic that you like, read, find or make an experiment or a report about it then:

1. Write a memo to a manager
2. Write a short report to a customer
3. Plan a poster to your friends (don't make it, just make a plan for it)
4. Plan a presentation about the topic, again, don't make it, just the outline and the plan of the presentation

Part 2 Tool (Octave/Matlab)

1. Assume a matrix named **Prod** contains data on production of various electronic devices at your company during several years. Each row of the matrix contains production data for a single year. The first element in each row contains the year, e.g., 2007 or 10012. The remaining elements in each represent the number of a specific part manufactured during that year.

For example, the second element might contain the number of 2N3904 transistors produced during each year, whereas the fifth column might contain the number of IC555 timer chips produced.

Write a single line of code to answer each of the following questions. You may use the results of any question to answer subsequent questions if desired. A sample **Prod** matrix is provided online. Note that your solution must work for any properly formatted matrix **Prod**.

- a. Create a row vector **TotalProd** that contains the total number of years in the first element and the total number of each item produced during all listed years in the remaining elements.
 - b. Create a row vector **AvgProd** that contains the total number of years in the first element and the average number of each item produced during all listed years in the remaining elements.
 - c. Create a two-column matrix **YearProd**. The first column should contain the same years as those in the first column of **Prod**, and the second column should contain the total number of all units produced during each year.
 - d. Create a two-column matrix **MaxProd**. Determine the maximum number of any type of device produced during each year and place the results in the second column of the corresponding row in **MaxProd**.
 - e. Determine the maximum number of any device produced during any year and place the result in the scalar **OverallMax**.
 - f. If your company makes a profit of one-fifth of one cent on each device produced, regardless of type, determine the total profit made during all listed years and place the result in **Profit**. Your result should be in dollars.
2. The Eco-Marathon is an annual competition sponsored by Shell Oil, in which participants build special vehicles to achieve the highest possible fuel efficiency. The Eco-Marathon is held around the world with events in the United Kingdom, Finland, France, Holland, Japan, and the United States. A world record was set in the Eco-Marathon by a French team in 2003 called Microjoule with a performance of 10,705 miles per gallon. The Microjoule runs on ethanol. Write a MATLAB program to determine how far the Microjoule will travel in kilometers given a user-specified amount of ethanol, provided in units of grams. For your test case, you may assume that the user provides 100 grams of ethanol.
3. An unmanned X-43 A scramjet test vehicle has achieved a maximum speed of Mach number 9.68 in a test flight over the Pacific Ocean. Mach number is defined as the speed of an object divided by the speed of sound. Assuming the speed of sound is 343 meters per second, write a MATLAB program to determine speed in units of miles per hour. Your program should ask the user to provide the speed as Mach number and return the speed in miles per hour in a formatted sentence, displayed as an integer value, as shown in the sample output below.

Sample Input/Output:

Enter the speed as a Mach number: 9.68

The speed of the plane is 7425 mph.

4. Determine the result of the following code, if $C = \begin{bmatrix} 1 & 0 & -1 \\ -2 & 2 & 3 \end{bmatrix}$, $\gg CO = C \leq 0$;

What is CO?

5. Write a function named **EvenSum** that will accept a matrix of unknown size and return the sum of all elements at the intersection of even numbered rows and even numbered columns. Note that your function must work with any size matrix. Also note that if the matrix is a scalar or a vector, the function will return zero since there are no even numbered rows or columns in those cases.

EXAMPLE: For the matrix shown, $A = \text{EvenSum}(\text{Test})$; will place the value 18 in A. The numbers added together are shown in bold face

$$= \begin{bmatrix} 1 & 3 & 5 & 3 & 4 \\ 0 & \mathbf{1} & 2 & \mathbf{6} & 0 \\ 6 & 4 & 5 & 5 & 1 \\ 3 & 5 & 5 & \mathbf{6} & 5 \end{bmatrix},$$

6. Consider the following loop

```
[r,c]=size(D);  
j=c;  
i=1;  
while j > 0  
    T(i,1)=D(i,i); T(i,2)=D(i,j);  
    i=i+1; j=j-1;  
end
```

If we ran the code and generated the following value for T, T = [2 11; 7 16]

what is D?

7. What is the output of M4 if M = [1 3 2; 6 0 2]

```
[rows,cols]=size(M);  
for r=1:1:2*rows  
    for c=1:1:2*cols  
        M4(r,c)=c;  
    end  
end
```

8. Write a program that will ask the user to input his age in year and it will calculate to him his age in days.
9. Write a program that takes a vector as it's input and returns the maximum, minimum, and mean of the given vector. And it returns how many positive, negative and 0 numbers in the vector as well.