# B.Tech (VII)- IT Workshop/MATLAB

## Unit 2

## Lab Assignment/Practise Question set 03

**NOTE:**

- Explore MATLAB Desktop environment before starting these experiments.
- All the variables provided are case sensitive.

1. Create a variable *myage* and store your age in it. Subtract 2 from the value of the variable. Add 1 to the value of the variable. Observe the Workspace Window and Command History Window as you do this.
2. Explain the difference between these two statements:

```
result = 9*2
result = 9*2;
```

3. Use the built-in function **namelengthmax** to find out the maximum number of characters that you can have in an identifier name under your version of MATLAB.
4. Create two variables to store a weight in pounds and ounces. Use **who** and **whos** to see the variables. Use **class** to see the types of the variables. Clear one of them and then use **who** and **whos** again.
5. Explore the **format** command in more detail. Use **help format** to find options. Experiment with **format bank** to display dollar values.
6. Find a **format** option that would result in the following output format:

```
>> 5/16 + 2/7
ans =
      67/112
```

7. Think about what the results would be for the following expressions, and then type them in to verify your answers.

```
25 / 5 * 5
4+3 ^ 2
(4+3) ^ 2
3 \ 12 + 5
4 - 2 * 3
```

*As the world becomes more "flat," it is increasingly important for engineers and scientists to be able to work with colleagues in other parts of the world. Correct conversion of data from one system of units to another (e.g., from the metric system to the American system or vice versa) is critically important.*

8. Create a variable *pounds* to store a weight in pounds. Convert this to kilograms and assign the result to a variable *kilos*. The conversion factor is 1 kg = 2.2 lb.

9. Create a variable *ftemp* to store a temperature in degrees Fahrenheit (F). Convert this to degrees Celsius (C) and store the result in a variable *ctemp*. The conversion factor is $C = (F - 32) \times 5/9$.
10. The following assignment statements either contain at least one error, or could be improved in some way. Assume that *radius* is a variable that has been initialized. First, identify the problem, and then fix and/or improve them:

```
33 = number
my variable = 11.11;
area = 3.14 * radius ^2;
x = 2 *3.14 * radius;
```

11. Experiment with the functional form of some operators such as **plus**, **minus**, and **times**.
12. Generate a random

    real number in the range (0, 20)
    real number in the range (20, 50)
    integer in the inclusive range from 1 to 10
    integer in the inclusive range from 0 to 10
    integer in the inclusive range from 50 to 100

13. Get into a new Command Window, and type **rand** to get a random real number. Make a note of the number. Then exit MATLAB and repeat this, again making a note of the random number; it should be the same as before. Finally, exit MATLAB and again get into a new Command Window. This time, change the seed before generating a random number; it should be different.
14. What is the difference between x and 'x'?

17. Explain the difference between constants and variables.
18. What would be the result of the following expressions?

```
'b' >= 'c' - 1
3 == 2 + 1
(3 == 2) + 1
xor(5 < 6, 8 > 4)
10 > 5 > 2
result = 3 ^2 - 20;
0 <= result <= 10
```

19. Create two variables *x* and *y* and store numbers in them. Write an expression that would be **true** if the value of *x* is greater than 5 or if the value of *y* is less than 10, but not if both of those are **true**.
20. Use the equality operator to verify that 3*10 ^5 is equal to 3e5.
21. In the ASCII character encoding, the letters of the alphabet are in order: 'a' comes before 'b' and also 'A' comes before 'B'. However, which comes first—lower or uppercase letters?
22. Are there equivalents to **intmin** and **intmax** for real number types? Use **help** to find out.

23. Use **intmin** and **intmax** to determine the range of values that can be stored in the types **uint32** and **uint64**.
24. Use the **cast** function to cast a variable to be the same type as another variable.
25. Use **help elfun** or experiment to answer the following questions:

    Is **fix(3.5)** the same as **floor(3.5)**?
    Is **fix(3.4)** the same as **fix(-3.4)**?
    Is **fix(3.2)** the same as **floor(3.2)**?
    Is **fix(-3.2)** the same as **floor(-3.2)**?
    Is **fix(-3.2)** the same as **ceil(-3.2)**?

26. For what range of values is the function **round** equivalent to the function **floor**? For what range of values is the function **round** equivalent to the function **ceil**?
27. Use **help** to determine the difference between the **rem** and **mod** functions.
28. Find MATLAB expressions for the following

    $\sqrt{19}$
    $3^{1.2}$
    $\tan(\pi)$

29. Using only the integers 2 and 3, write as many expressions as you can that result in 9. Try to come up with at least 10 different expressions (Note: don't just change the order). Be creative! Make sure that you write them as MATLAB expressions. Use operators and/or built-in functions.
30. A vector can be represented by its rectangular coordinates *x* and *y* or by its polar coordinates *r* and $\theta$. Theta is measured in radians. The relationship between them is given by the equations:

    ```
    x = r * cos(θ)
    y = r * sin(θ)
    ```

    Assign values for the polar coordinates to variables *r* and *theta*. Then, using these values, assign the corresponding rectangular coordinates to variables *x* and *y*.
31. In special relativity, the Lorentz factor is a number that describes the effect of speed on various physical properties when the speed is significantly relative to the speed of light. Mathematically, the Lorentz factor is given as:

    $$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

    Use $3 \times 10^8$ m/s for the speed of light, *c*. Create variables for *c* and the speed *v* and from them a variable *lorentz* for the Lorentz factor.

32. A company manufactures a part for which there is a desired weight. There is a tolerance of *N*%, meaning that the range between minus and plus *N*% of the desired weight is acceptable. Create a variable that stores a weight and another variable for *N* (e.g., set it to 2). Create variables that store the minimum and maximum values in the acceptable range of weights for this part.

33. An environmental engineer has determined that the cost $C$ of a containment tank will be based on the radius $r$ of the tank:

$$C = \frac{32,430}{r} + 428\pi r$$

Create a variable for the radius, and then for the cost.

34. A chemical plant releases an amount $A$ of pollutant into a stream. The maximum concentration $C$ of the pollutant at a point which is at a distance $x$ from the plant is:

$$C = \frac{A}{x}\sqrt{\frac{2}{\Pi e}}$$

Create variables for the values of $A$ and $x$, and then for $C$. Assume that the distance $x$ is in meters. Experiment with different values for $x$.

35. The geometric mean $g$ of $n$ numbers $x_i$ is defined as the $n$th root of the product of $x_i$:

$$g = \sqrt[n]{x_1 x_2 x_3 \ldots x_n}$$

(This is useful, for example, in finding the average rate of return for an investment which is something you'd do in engineering economics.) If an investment returns 15% the first year, 50% the second, and 30% the third year, the average rate of return would be `(1.15*1.50*1.30)^(1/3)`. Compute this.

36. Use the **deg2rad** function to convert 180 degrees to radians.