# DAILY ASSESSMENT

# Morning session

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| **Date:** | **9/06/2020** | **Name:** | **Rashmi KB** |
| **Course:** | **VLSI** | **USN:** | **4AL16EC056** |
| **Topic:** | MOSFET - Enhancement Type MOSFET Explained (Construction, Working and Characteristics Explained), GATE 2009 and 20121 ECE operating region and output voltage of CMOS inverter, MOSFET with based problems, MOSFET problems and solutions, TRICK to implement 4:1 mux using Transmission Gate &amp; Pass Transistor Logic, MOSFET Drain current - graph ,formulae &amp; sums (cutoff, linear & amp; saturation), Realization of logic function using Multiplexer | **Sem & sec** | **8 - B** |
| **GitHub Repository:** | **rashmikb** |  |  |

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| **FORENOON SESSION DETAILS** |
| **Image of session**       REPORT –  * FETs have a few disadvantages like high drain resistance, moderate input impedance and slower operation. * To overcome these disadvantages, the MOSFET which is an advanced FET is invented. * **MOSFET** stands for Metal Oxide Silicon Field Effect Transistor or Metal Oxide Semiconductor Field Effect Transistor. * This is also called as IGFET meaning Insulated Gate Field Effect Transistor. The FET is operated in both depletion and enhancement modes of operation.  Construction of a MOSFET  * The construction of a MOSFET is a bit similar to the FET. An oxide layer is deposited on the substrate to which the gate terminal is connected. * This oxide layer acts as an insulator (sio2 insulates from the substrate), and hence the MOSFET has another name as IGFET. In the construction of MOSFET, a lightly doped substrate, is diffused with a heavily doped region. * Depending upon the substrate used, they are called as **P-type** and **N-type** MOSFETs. The following figure shows the construction of a MOSFET. * The voltage at gate controls the operation of the MOSFET. In this case, both positive and negative voltages can be applied on the gate as it is insulated from the channel. With negative gate bias voltage, * It acts as **depletion MOSFET** while with positive gate bias voltage it acts as an **Enhancement MOSFET**  Classification of MOSFETs  * Depending upon the type of materials used in the construction, and the type of operation, the MOSFETs are classified as in the following figure.   MOSFET Classification Construction of N- Channel MOSFET  * Let us consider an N-channel MOSFET to understand its working. * A lightly doped P-type substrate is taken into which two heavily doped N-type regions are diffused, which act as source and drain. Between these two N+ regions, there occurs diffusion to form an N- channel, connecting drain and source.   N-Channel MOSFET Construction   * A thin layer of **Silicon dioxide (SiO2)** is grown over the entire surface and holes are made to draw ohmic contacts for drain and source terminals. * A conducting layer of **aluminum** is laid over the entire channel, upon this **SiO2** layer from source to drain which constitutes the gate. The **SiO2 substrate** is connected to the common or ground terminals.  Working of N - Channel depletion mode  * We can also observe that, the diffused channel N between two N+regions between two N+regions, the **insulating dielectric SiO2** and the aluminum metal layer of the gate together form a **parallel plate capacitor**. * If the NMOS has to be worked in depletion mode, the gate terminal should be at negative potential while drain is at positive potential, as shown in the following figure.   N-Channel MOSFET Working   * When no voltage is applied between gate and source, some current flows due to the voltage between drain and source. Let some negative voltage is applied at **VGG**. Then the minority carriers i.e. holes, get attracted and settle near **SiO2** layer. But the majority carriers, i.e., electrons get repelled. * With some amount of negative potential at **VGG** a certain amount of drain current **ID** flows through source to drain. When this negative potential is further increased, the electrons get depleted and the current **ID** decreases. Hence the more negative the applied **VGG**, the lesser the value of drain current **ID** will be. * The channel nearer to drain gets more depleted than at source like in FET like in FET and the current flow decreases due to this effect. Hence it is called as depletion mode MOSFET.  Transfer Characteristics  * Transfer characteristics define the change in the value of **VDS** with the change in **ID** and **VGS** in both depletion and enhancement modes. * The below transfer characteristic curve is drawn for drain current versus gate to source voltage.   Transfer Characteristics Transmission gate logic based 4:1 MUX  * This design is the transmission gate type of MUX structure implemented with very minimum transistors compared to the conventional CMOS based design. * The back-to-back connected PMOS and NMOS arrangement acts as a switch is so called transmission gate. NMOS devices pass a strong 0 but a weak 1, while PMOS pass a strong 1 but a weak 0. * The transmission gate combines the best of both the properties by placing NMOS in parallel with the PMOS device.   **figure5**   * A **multiplexer** performs the function of selecting the input on any one of 'n' input lines and feeding this input to one output line. * Multiplexers are used as one method of reducing the number of integrated circuit packages required by a particular circuit design. This in turn reduces the cost of the system. * Assume that we have four lines, ***C*0, *C*1, *C*2 and *C*3**, which are to be multiplexed on a single line, ***Output (f)***. * The four input lines are also known as the ***Data Inputs***. Since there are four inputs, we will need two additional inputs to the multiplexer, known as the ***Select Inputs***, to select which of the ***C*** inputs is to appear at the output. Call these select lines ***A and B***. * The gate implementation of a 4-line to 1-line multiplexer is shown below:   Implementation of a multiplexer |

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# Afternoon session

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| **Date:** | **9/06/2020** | **Name:** | **Rashmi KB** |
| **Course:** | **Java** | **USN:** | **4AL16EC056** |
| **Topic:** | Hello world program ,using variables, strings, While loop, for loop, if, do while, switches ,array | **Sem & sec** | **8 -B** |
| **GitHub Repository:** | **rashmikb** |  |  |

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| **Image of session** |
| **Report :** While loop: Java while loop is a control flow statement that allows code to be executed repeatedly based on a given Boolean condition. The while loop can be thought of as a repeating if statement. Syntax: while (test\_expression)  {  update\_expression;  }  The various parts of the While loop are:   1. Test Expression: In this expression we have to test the condition. If the condition evaluates to true then we will execute the body of the loop and go to update expression. Otherwise, we will exit from the while loop.   Example: i <= 10   1. Update Expression: After executing the loop body, this expression increments/decrements the loop variable by some value.   Example:  i++; How does a While loop executes?  1. Control falls into the while loop. 2. The flow jumps to Condition 3. Condition is tested.    1. If Condition yields true, the flow goes into the Body.    2. If Condition yields false, the flow goes outside the loop 4. The statements inside the body of the loop get executed. 5. Updation takes place. 6. Control flows back to Step 2.   The do-while loop has ended and the flow has gone outside  **Example 1:** This program will try to print “Hello World” 5 times. filter\_none  edit play\_arrow brightness\_4  // Java program to illustrate while loop.  class whileLoopDemo {  public static void main(String args[])  {  // initialization expression int i = 1;  // test expression while (i < 6) { i++;  }  }  } Output: Hello World Hello World Hello World Hello World Hello World For loop in java: Loops are used to execute a set of statements repeatedly until a particular condition is satisfied. In Java we have three types of basic loops: for, while and do- while. In this tutorial we will learn how to use “for loop” in Java. Syntax of for loop: for(initialization; condition ; increment/decrement)  {  statement(s);  } Flow of Execution of the for Loop: As a program executes, the interpreter always keeps track of which statement is about to be executed. We call this the control flow, or the flow of execution of the program.  System.out.println("Hello World"); do-while Loop: The do-while loop is used to iterate a part of the program several times. If the number of iteration is not fixed and you must have to execute the loop at least once, it is recommended to use do-while loop.  The do-while loop is executed at least once because condition is checked after loop body.  Syntax:   1. **do**{ 2. //code to be executed   }**while**(condition); Strings: Strings in Java are Objects that are backed internally by a char array. Since arrays are immutable(cannot grow), Strings are immutable as well. Whenever a change to a String is made, an entirely new String is created.  Below is the basic syntax for declaring a string in Java programming language. Syntax: <String\_Type> <string\_variable> = “<sequence\_of\_string>”; Switches: A switch statement allows a variable to be tested for equality against a list of values. Each value is called a case, and the variable being switched on is checked for each case. Syntax  The syntax of enhanced for loop is − switch(expression) {  case value :  // Statements break; // optional  case value :  // Statements break; // optional  // You can have any number of case statements. default : // Optional  // Statements  }  **Array:**  Java array is an object which contains elements of a similar data type. Additionally, The elements of an array are stored in a contiguous memory location. It is a data structure where we store similar elements. We can store only a fixed set of elements in a Java array.Array in Java is index-based, the first element of the array is stored at the 0th index, 2nd element is stored on 1st index and so on.  In Java, array is an object of a dynamically generated class. Java array inherits the Object class, and implements the Serializable as well as Cloneable interfaces. We can store primitive values or objects in an array in Java. Like C/C++, we can also create single dimentional or multi dimentional arrays in Java. |