**SYSTEM VERILOG PROGRAMS**

**MELVIN RIJOHN T**

**Array Types**

module array\_types();

    int arr[3] = {20,40,34};

    string arr1[3] = {"Hello","World","!"};

    string arr2[];

    int arr3[string];

    initial begin

        arr2 = new[4];

        arr2 = {"Hello","vlsi","world"};

        arr3["RED"] = 128;

        arr3["GREEN"] = 230;

        arr3["BLUE"] = 10;

        $display("/\*\*\*\* Simple Integer Array \*\*\*\*/");

        foreach(arr[i]) begin

            $display("arr[%0d]: %0d",i, arr[i]);

        end

        $display("/\*\*\*\* Simple String Array \*\*\*\*/");

        foreach(arr1[i]) begin

            $display("arr1[%0d]: %0s",i, arr1[i]);

        end

        $display("/\*\*\*\* Dynamic Array \*\*\*\*/");

        foreach(arr2[i]) begin

            $display("arr2[%0d]: %0s",i, arr2[i]);

        end

        $display("/\*\*\*\* Associative Array \*\*\*\*/");

        $display("arr3[RED]: %0d", arr3["RED"]);

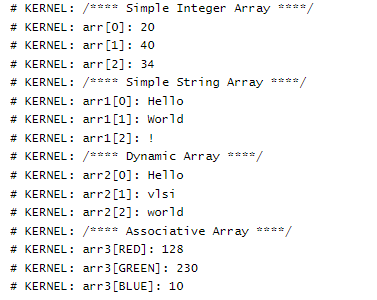
        $display("arr3[GREEN]: %0d", arr3["GREEN"]);

        $display("arr3[BLUE]: %0d", arr3["BLUE"]);

    end

endmodule

OUTPUT



**PROCESS, TASK & FUNCTIONS**

module process\_task();

    int a,b,c,sum;

    task t1(int x, int y);

        begin

            #10;

            $display("Sum: %0d", a+b);

        end

    endtask

    task t2(int x, int y);

        begin

            #10;

            $display("Difference: %0d", a-b);

        end

    endtask

    function int f1(int x, int y, int z);

        begin

            f1 = x + (z - y);

        end

    endfunction

    initial begin

        a = 37; b = 8; c = 66; #10;

        $display("/\*\*\*\*\* Initial Values \*\*\*\*/");

        $display("a = %0d b = %0d c = %0d", a,b,c);

        $display("/\*\*\*\*FORK JOIN\*\*\*\*/");

        fork

            t1(a,b);

            t2(a,b);

        join

        $display("Sum & Differnce: %0d", f1(a,b,c));

         $display("/\*\*\*\*FORK JOIN ANY\*\*\*\*/");

        fork

            t1(a,b);

            t2(a,b);

        join\_any

        $display("Sum & Differnce: %0d", f1(a,b,c));

         $display("/\*\*\*\*FORK JOIN NONE\*\*\*\*/");

        fork

            t1(a,b);

            t2(a,b);

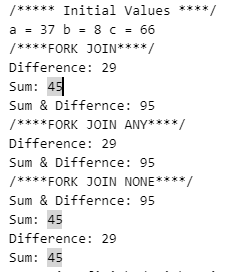
        join\_none

        $display("Sum & Differnce: %0d", f1(a,b,c));

    end

endmodule

OUTPUT



**MUX 2x1**

module mux\_2x1 (

    input logic a,

    input logic b,

    input logic s,

    output logic y

);

    assign  y = (s ? b : a);

endmodule

module mux\_2x1\_tb ();

    logic a,b,s,y;

    mux\_2x1 dut(a,b,s,y);

    initial begin

        $dumpfile("out.vcd");

        $dumpvars(0, mux\_2x1\_tb);

        $monitor("a=%0d b=%0d s=%0d y=%0d",a,b,s,y);

        a=0; b=0; s=0; #10;

        a=0; b=1; s=0; #10;

        a=1; b=0; s=0; #10;

        a=1; b=1; s=0; #10;

        a=0; b=0; s=1; #10;

        a=0; b=1; s=1; #10;

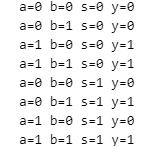
        a=1; b=0; s=1; #10;

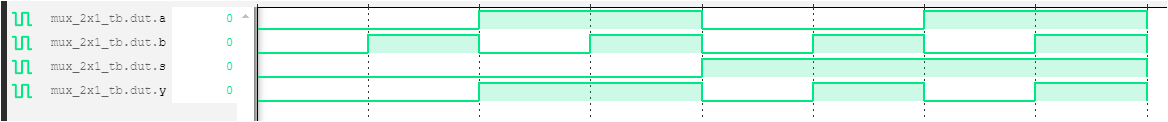
        a=1; b=1; s=1; #10;

    end

endmodule

OUTPUT





**DATA TYPES**

module dataTypes\_tb ();

    logic[7:0] a,b;

    logic [7:0] c,d;

    string e,g;

    bit[31:0] f = 128;

    typedef struct packed {

        int RED;

        int GREEN;

        int BLUE;

    } RGB\_color;

    typedef struct{

        int RED;

        int GREEN;

        int BLUE;

        string ALPHA;

    } RGBA\_color;

    typedef union packed {

        int i;

        int s;

    } something;

    class Printer;

        function void log(string msg);

            $display(msg);

        endfunction

    endclass

    RGB\_color rgb; //struct

    RGBA\_color rgba; //unpacked struct

    something some; //union

    Printer console; //class

    initial begin

        a=5; b=10;

        c = a + b;

        d = c - a;

        g = "Hello";

        rgb.RED = 122;

        rgb.GREEN = 233;

        rgb.BLUE = 111;

        rgba.RED = 122;

        rgba.GREEN = 233;

        rgba.BLUE = 111;

        rgba.ALPHA = "120";

        some.i = 0;

        e = $sformatf("%0d", f); //converts bit value to string

        $display("a=%0d b=%0d c=%0d d=%d e=%0s f=0x%0h",a,b,c,d,e,f);

        $display("Len: %0d",e.len());

        $display("RGB: #%0h%0h%0h", rgb.RED, rgb.GREEN, rgb.BLUE);

      $display("RGBA: #%0h%0h%0h%0s", rgba.RED, rgba.GREEN, rgba.BLUE, rgba.ALPHA); //unpacked struct

        $display("union: {i: %0d, s: %0d}", some.i,some.s);

        some.s = 255;

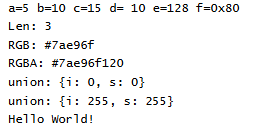
        $display("union: {i: %0d, s: %0d}", some.i,some.s);

        console.log("Hello World!");

    end

endmodule

OUTPUT



**Events**

module events\_mgmt ();

    event ev1;

    initial begin

        fork

            begin

                 #60;

                 $display($time,"\t Triggring Event");

                 -> ev1;

            end

            begin

               $display($time,"\t Waitingg for event trigger");

               #20;

              @(ev1);

               $display($time,"\t Event Triggered");

            end

        join

    end

    initial begin

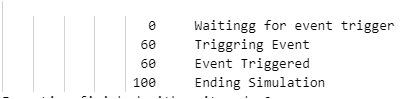
        #100;

      $display($time,"\t Ending Simulation");

    end

endmodule

OUTPUT



**Extern Keyword (Task Example)**

//class with extern task

class packet;

  bit [31:0] addr;

  bit [31:0] data;

  extern virtual task display();

endclass

task packet::display();

  $display("ADDRESS: 0x%0h", addr);

  $display("DATA: 0x%0h", data);

endtask

module extern\_class\_tb;

  initial begin

    packet p;

    p = new();

    p.addr = 120;

    p.data = 200;

    p.display();

  end

endmodule

OUTPUT



**Extern Keyword (Function Example)**

class packet;

  bit [31:0] addr;

  bit [31:0] data;

  extern virtual function void display();

endclass

function void packet::display();

    $display("ADDRESS: 0x%0h", addr);

    $display("DATA: 0x%0h", data);

endfunction

module extern\_method;

  initial begin

    packet p;

    p = new();

    p.addr = 110;

    p.data = 240;

    p.display();

  end

endmodule

OUTPUT



**Parameterized Class**

class packet #(parameter int WIDTH,int DEPTH);

    function void print();

        $display("WIDTH: %0d", WIDTH);

        $display("DEPTH: %0d", DEPTH);

    endfunction

endclass

module tb;

    initial begin

        packet #(16, 8) pkt = new(); // Ensure this is at the correct scope

        pkt.print();

    end

endmodule

OUTPUT

