مداری برای مدیریت پارکینگ دانشگاه طراحی می‌کنیم که امکانات زیر را داشته باشد:

- اولویت فضای پارکینگ با اساتید و کارمندان دانشگاه است و این ظرفیت حداکثر ۵۰۰ خودرو است.
- فضای کل پارکینگ ۷۰۰ خودرو است و از ساعت ۸ تا ۱۳ تنها ۲۰۰ ظرفیت خالی برای ورود آزاد است.
- از ساعت ۱۳ تا ۱۶ به ازای هر ساعت، ظرفیت ورود آزاد ۵۰ خودرو افزایش می‌یابد و در ساعت ۱۶، ظرفیت ورود آزاد به ۵۰۰ خودرو می‌رسد.

ماژولی به زبان وریلاگ برای این مدار طراحی می‌کنیم. این ماژول دارای ورودی‌ها و خروجی‌های زیر است:

ورودی‌ها	
ورود یک خودرو	car_entered
آیا خودرو وارد شده متعلق به دانشگاه است؟	is_uni_car_entered
خروج یک خودرو	car_exited
آیا خودرو خارج شده متعلق به دانشگاه است؟	is_uni_car_exited
خروجی‌ها	
ساعت کنونی	hour
تعداد خودروهایی متعلق به دانشگاه که در پارکینگ پارک شده اند.	uni_parked_cars
تعداد خودروهای پارک شده در پارکینگ مربوط به ظرفیت آزاد	parked_cars
تعداد فضای خالی متعلق به دانشگاه	uni_vacated_space
تعداد فضاهای خالی مربوط به ظرفیت آزاد	vacated_space
آیا فضای خالی برای دانشگاه موجود است؟	uni_is_vacated_space
آیا فضای خالی برای ظرفیت آزاد موجود است؟	is_vacated_space

الف)

اولین بلوک always که با کلاک کار می‌کند، برای مدیریت ورود و خروج ماشین‌ها و محاسبه‌ی تعداد ماشین‌های پارک‌شده‌ی مربوط به دانشگاه و آزاد است. مکانیزم ریست در این بلوک وجود دارد که با سیگنال ریست یا رسیدن ساعت به ۲۴ کار می‌کند و ساعت را روی ۸ (آغاز کار پارکینگ) تنظیم می‌کند. در غیر این صورت، با گذشتن هر ده کلاک، یک ساعت می‌گذرد و در هر کلاک، یک ماشین می‌تواند وارد یا خارج شود. با توجه به ورودی is_uni_car_entered یا is_uni_car_exited تشخیص می‌دهیم که ظرفیت پر کدام دسته را تغییر دهیم. در بلوک always دوم، با توجه به زمان، ظرفیت کل دانشگاه و آزاد تعیین می‌شود. در نهایت، در بلوک آخر، ظرفیت خالی هر دو دسته از ماشین‌ها محاسبه می‌شود. در طراحی این ماژول، دقت شده که هیچ متغیری در بیش از یک بلوک، مقداردهی نشود.

```
module parking (
    input clk, reset, car_entered, is_uni_car_entered, car_exited, is_uni_car_exited,
    output reg [9:0] uni_parked_cars, parked_cars, uni_vacated_space, vacated_space,
    output reg uni_is_vacated_space, is_vacated_space,
    output reg [4:0] hour
    );

    reg [9:0] uni_capacity, capacity;
    reg [7:0] clocks;

    always @(posedge clk or negedge reset) begin
        if (!reset || (hour == 5'd24)) begin
            uni_parked_cars <= 0;
            parked_cars <= 0;
            clocks <= 0;
            hour <= 5'd8;
        end
        else begin
            clocks <= clocks + 8'b1;
            if ((clocks % 8'd10) == 0)
                hour <= hour + 5'b1;
            if (car_entered) begin
                if (is_uni_car_entered && (uni_parked_cars < uni_capacity))
                    uni_parked_cars <= uni_parked_cars + 10'b1;
                else if (!is_uni_car_entered && (parked_cars < capacity))
                    parked_cars <= parked_cars + 10'b1;
            end
            if (car_exited) begin
                if (is_uni_car_exited && (uni_parked_cars > 0))
                    uni_parked_cars <= uni_parked_cars - 10'b1;
                else if (!is_uni_car_exited && (parked_cars > 0))
                    parked_cars <= parked_cars - 10'b1;
```

```
            end
        end
    end

    always @(*) begin
        if (hour < 5'd13) begin
            uni_capacity = 10'd500;
            capacity = 10'd200;
        end
        else if (hour < 5'd14) begin
            uni_capacity = 10'd450;
            capacity = 10'd250;
        end
        else if (hour < 5'd15) begin
            uni_capacity = 10'd400;
            capacity = 10'd300;
        end
        else if (hour < 5'd16) begin
            uni_capacity = 10'd350;
            capacity = 10'd350;
        end
        else begin
            uni_capacity = 10'd200;
            capacity = 10'd500;
        end
    end

    always @(*) begin
        uni_vacated_space = uni_capacity - uni_parked_cars;
        vacated_space = capacity - parked_cars;
        uni_is_vacated_space = (uni_vacated_space > 0);
        is_vacated_space = (vacated_space > 0);
    end

endmodule
```

حال، به برنامه‌ی آزمون می‌پردازیم. این برنامه، در هر ساعت از ۸ تا ۱۳، پنج ماشین دانشگاه و یک ماشین آزاد را وارد، و یک ماشین دانشگاه را خارج می‌کند. سپس به ساعت ۱۴ می‌پرد و هشت ماشین آزاد را در این ساعت وارد می‌کند. پس از آن، به ساعت ۱۶ می‌پرد و تا ساعت ۲۳، سه ماشین دانشگاه و شش ماشین آزاد را خارج می‌کند.

```
module parking_tb;
    reg clk, reset, car_entered, is_uni_car_entered, car_exited, is_uni_car_exited;
    wire [9:0] uni_parked_cars, parked_cars, uni_vacated_space, vacated_space;
    wire uni_is_vacated_space, is_vacated_space;
    wire [4:0] hour;
    parking uut (
        clk, reset, car_entered, is_uni_car_entered, car_exited, is_uni_car_exited,
        uni_parked_cars, parked_cars, uni_vacated_space, vacated_space,
```

```
        uni_is_vacated_space, is_vacated_space, hour
    );
    integer i;

    initial begin
        clk = 0;
        reset = 0;
        car_entered = 0;
        is_uni_car_entered = 0;
        car_exited = 0;
        is_uni_car_exited = 0;

        #10 reset = 1;
        #5;
        // 8-13 o'clock
        for (i = 0; i < 5; i = i + 1) begin
            #10 car_entered = 1; is_uni_car_entered = 1; // Faculty car enters
            #50 car_entered = 1; is_uni_car_entered = 0; // Public car enters
            #10 car_entered = 0; car_exited = 1; is_uni_car_exited = 1; // Faculty car
exits
            #10 car_exited = 0;
        end

        #100; // Skip to 14 o'clock
        #10 car_entered = 1; is_uni_car_entered = 0; // Public car enters
        #90 car_entered = 0;

        #100; // Skip to 16 o'clock
        for (i = 0; i < 7; i = i + 1) begin
            #10 car_exited = 1; is_uni_car_exited = 1; // Faculty car exits
            #30 car_exited = 1; is_uni_car_exited = 0; // Public car exits
            #60 car_exited = 0;
        end
        // Now: 23 o'clock

        #110; // Skip to 24 o'clock
        #10; // Back to 8 o'clock
        $stop;
    end

    always #5 clk = ~clk;

    initial begin
        $monitor (
            $time, " hour: %d, uni_parked_cars: %d, parked_cars: %d, uni_vacated_space:
%d, vacated_space: %d, uni_is_vacated_space: %d, is_vacated_space: %d",
            hour, uni_parked_cars, parked_cars, uni_vacated_space, vacated_space,
uni_is_vacated_space, is_vacated_space
        );
    end
endmodule
```

```
   0 hour:  8, uni_parked_cars:   0, parked_cars:   0, uni_vacated_space:  500, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
  15 hour:  9, uni_parked_cars:   0, parked_cars:   0, uni_vacated_space:  500, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
  25 hour:  9, uni_parked_cars:   1, parked_cars:   0, uni_vacated_space:  499, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
  35 hour:  9, uni_parked_cars:   2, parked_cars:   0, uni_vacated_space:  498, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
  45 hour:  9, uni_parked_cars:   3, parked_cars:   0, uni_vacated_space:  497, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
  55 hour:  9, uni_parked_cars:   4, parked_cars:   0, uni_vacated_space:  496, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
  65 hour:  9, uni_parked_cars:   5, parked_cars:   0, uni_vacated_space:  495, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
  75 hour:  9, uni_parked_cars:   5, parked_cars:   1, uni_vacated_space:  495, vacated_space:  199, uni_is_vacated_space: 1, is_vacated_space: 1
  85 hour:  9, uni_parked_cars:   4, parked_cars:   1, uni_vacated_space:  496, vacated_space:  199, uni_is_vacated_space: 1, is_vacated_space: 1
 105 hour:  9, uni_parked_cars:   5, parked_cars:   1, uni_vacated_space:  495, vacated_space:  199, uni_is_vacated_space: 1, is_vacated_space: 1
 115 hour: 10, uni_parked_cars:   6, parked_cars:   1, uni_vacated_space:  494, vacated_space:  199, uni_is_vacated_space: 1, is_vacated_space: 1
 125 hour: 10, uni_parked_cars:   7, parked_cars:   1, uni_vacated_space:  493, vacated_space:  199, uni_is_vacated_space: 1, is_vacated_space: 1
 135 hour: 10, uni_parked_cars:   8, parked_cars:   1, uni_vacated_space:  492, vacated_space:  199, uni_is_vacated_space: 1, is_vacated_space: 1
 145 hour: 10, uni_parked_cars:   9, parked_cars:   1, uni_vacated_space:  491, vacated_space:  199, uni_is_vacated_space: 1, is_vacated_space: 1
 155 hour: 10, uni_parked_cars:   9, parked_cars:   2, uni_vacated_space:  491, vacated_space:  198, uni_is_vacated_space: 1, is_vacated_space: 1
 165 hour: 10, uni_parked_cars:   8, parked_cars:   2, uni_vacated_space:  492, vacated_space:  198, uni_is_vacated_space: 1, is_vacated_space: 1
 185 hour: 10, uni_parked_cars:   9, parked_cars:   2, uni_vacated_space:  491, vacated_space:  198, uni_is_vacated_space: 1, is_vacated_space: 1
 195 hour: 10, uni_parked_cars:  10, parked_cars:   2, uni_vacated_space:  490, vacated_space:  198, uni_is_vacated_space: 1, is_vacated_space: 1
 205 hour: 10, uni_parked_cars:  11, parked_cars:   2, uni_vacated_space:  489, vacated_space:  198, uni_is_vacated_space: 1, is_vacated_space: 1
 215 hour: 11, uni_parked_cars:  12, parked_cars:   2, uni_vacated_space:  488, vacated_space:  198, uni_is_vacated_space: 1, is_vacated_space: 1
 225 hour: 11, uni_parked_cars:  13, parked_cars:   2, uni_vacated_space:  487, vacated_space:  198, uni_is_vacated_space: 1, is_vacated_space: 1
 235 hour: 11, uni_parked_cars:  13, parked_cars:   3, uni_vacated_space:  487, vacated_space:  197, uni_is_vacated_space: 1, is_vacated_space: 1
 245 hour: 11, uni_parked_cars:  12, parked_cars:   3, uni_vacated_space:  488, vacated_space:  197, uni_is_vacated_space: 1, is_vacated_space: 1
 265 hour: 11, uni_parked_cars:  13, parked_cars:   3, uni_vacated_space:  487, vacated_space:  197, uni_is_vacated_space: 1, is_vacated_space: 1
 275 hour: 11, uni_parked_cars:  14, parked_cars:   3, uni_vacated_space:  486, vacated_space:  197, uni_is_vacated_space: 1, is_vacated_space: 1
 285 hour: 11, uni_parked_cars:  15, parked_cars:   3, uni_vacated_space:  485, vacated_space:  197, uni_is_vacated_space: 1, is_vacated_space: 1
 295 hour: 11, uni_parked_cars:  16, parked_cars:   3, uni_vacated_space:  484, vacated_space:  197, uni_is_vacated_space: 1, is_vacated_space: 1
 305 hour: 11, uni_parked_cars:  17, parked_cars:   3, uni_vacated_space:  483, vacated_space:  197, uni_is_vacated_space: 1, is_vacated_space: 1
 315 hour: 12, uni_parked_cars:  17, parked_cars:   4, uni_vacated_space:  483, vacated_space:  196, uni_is_vacated_space: 1, is_vacated_space: 1
 325 hour: 12, uni_parked_cars:  16, parked_cars:   4, uni_vacated_space:  484, vacated_space:  196, uni_is_vacated_space: 1, is_vacated_space: 1
 345 hour: 12, uni_parked_cars:  17, parked_cars:   4, uni_vacated_space:  483, vacated_space:  196, uni_is_vacated_space: 1, is_vacated_space: 1
 355 hour: 12, uni_parked_cars:  18, parked_cars:   4, uni_vacated_space:  482, vacated_space:  196, uni_is_vacated_space: 1, is_vacated_space: 1
 365 hour: 12, uni_parked_cars:  19, parked_cars:   4, uni_vacated_space:  481, vacated_space:  196, uni_is_vacated_space: 1, is_vacated_space: 1
 375 hour: 12, uni_parked_cars:  20, parked_cars:   4, uni_vacated_space:  480, vacated_space:  196, uni_is_vacated_space: 1, is_vacated_space: 1
 385 hour: 12, uni_parked_cars:  21, parked_cars:   4, uni_vacated_space:  479, vacated_space:  196, uni_is_vacated_space: 1, is_vacated_space: 1
 395 hour: 12, uni_parked_cars:  21, parked_cars:   5, uni_vacated_space:  479, vacated_space:  195, uni_is_vacated_space: 1, is_vacated_space: 1
 405 hour: 12, uni_parked_cars:  20, parked_cars:   5, uni_vacated_space:  480, vacated_space:  195, uni_is_vacated_space: 1, is_vacated_space: 1
 415 hour: 13, uni_parked_cars:  20, parked_cars:   5, uni_vacated_space:  430, vacated_space:  245, uni_is_vacated_space: 1, is_vacated_space: 1
 515 hour: 14, uni_parked_cars:  20, parked_cars:   5, uni_vacated_space:  380, vacated_space:  295, uni_is_vacated_space: 1, is_vacated_space: 1
 525 hour: 14, uni_parked_cars:  20, parked_cars:   6, uni_vacated_space:  380, vacated_space:  294, uni_is_vacated_space: 1, is_vacated_space: 1
 535 hour: 14, uni_parked_cars:  20, parked_cars:   7, uni_vacated_space:  380, vacated_space:  293, uni_is_vacated_space: 1, is_vacated_space: 1
 545 hour: 14, uni_parked_cars:  20, parked_cars:   8, uni_vacated_space:  380, vacated_space:  292, uni_is_vacated_space: 1, is_vacated_space: 1
 555 hour: 14, uni_parked_cars:  20, parked_cars:   9, uni_vacated_space:  380, vacated_space:  291, uni_is_vacated_space: 1, is_vacated_space: 1
 565 hour: 14, uni_parked_cars:  20, parked_cars:  10, uni_vacated_space:  380, vacated_space:  290, uni_is_vacated_space: 1, is_vacated_space: 1
 575 hour: 14, uni_parked_cars:  20, parked_cars:  11, uni_vacated_space:  380, vacated_space:  289, uni_is_vacated_space: 1, is_vacated_space: 1
 585 hour: 14, uni_parked_cars:  20, parked_cars:  12, uni_vacated_space:  380, vacated_space:  288, uni_is_vacated_space: 1, is_vacated_space: 1
 595 hour: 14, uni_parked_cars:  20, parked_cars:  13, uni_vacated_space:  380, vacated_space:  287, uni_is_vacated_space: 1, is_vacated_space: 1
 605 hour: 14, uni_parked_cars:  20, parked_cars:  14, uni_vacated_space:  380, vacated_space:  286, uni_is_vacated_space: 1, is_vacated_space: 1
 615 hour: 15, uni_parked_cars:  20, parked_cars:  14, uni_vacated_space:  330, vacated_space:  336, uni_is_vacated_space: 1, is_vacated_space: 1
 715 hour: 16, uni_parked_cars:  20, parked_cars:  14, uni_vacated_space:  180, vacated_space:  486, uni_is_vacated_space: 1, is_vacated_space: 1
 725 hour: 16, uni_parked_cars:  19, parked_cars:  14, uni_vacated_space:  181, vacated_space:  486, uni_is_vacated_space: 1, is_vacated_space: 1
 735 hour: 16, uni_parked_cars:  18, parked_cars:  14, uni_vacated_space:  182, vacated_space:  486, uni_is_vacated_space: 1, is_vacated_space: 1
 745 hour: 16, uni_parked_cars:  17, parked_cars:  14, uni_vacated_space:  183, vacated_space:  486, uni_is_vacated_space: 1, is_vacated_space: 1
 755 hour: 16, uni_parked_cars:  17, parked_cars:  13, uni_vacated_space:  183, vacated_space:  487, uni_is_vacated_space: 1, is_vacated_space: 1
 765 hour: 16, uni_parked_cars:  17, parked_cars:  12, uni_vacated_space:  183, vacated_space:  488, uni_is_vacated_space: 1, is_vacated_space: 1
 775 hour: 16, uni_parked_cars:  17, parked_cars:  11, uni_vacated_space:  183, vacated_space:  489, uni_is_vacated_space: 1, is_vacated_space: 1
 785 hour: 16, uni_parked_cars:  17, parked_cars:  10, uni_vacated_space:  183, vacated_space:  490, uni_is_vacated_space: 1, is_vacated_space: 1
 795 hour: 16, uni_parked_cars:  17, parked_cars:   9, uni_vacated_space:  183, vacated_space:  491, uni_is_vacated_space: 1, is_vacated_space: 1
 805 hour: 16, uni_parked_cars:  17, parked_cars:   8, uni_vacated_space:  183, vacated_space:  492, uni_is_vacated_space: 1, is_vacated_space: 1
 815 hour: 17, uni_parked_cars:  17, parked_cars:   8, uni_vacated_space:  183, vacated_space:  492, uni_is_vacated_space: 1, is_vacated_space: 1
 825 hour: 17, uni_parked_cars:  16, parked_cars:   8, uni_vacated_space:  184, vacated_space:  492, uni_is_vacated_space: 1, is_vacated_space: 1
 835 hour: 17, uni_parked_cars:  15, parked_cars:   8, uni_vacated_space:  185, vacated_space:  492, uni_is_vacated_space: 1, is_vacated_space: 1
 845 hour: 17, uni_parked_cars:  14, parked_cars:   8, uni_vacated_space:  186, vacated_space:  492, uni_is_vacated_space: 1, is_vacated_space: 1
 855 hour: 17, uni_parked_cars:  14, parked_cars:   7, uni_vacated_space:  186, vacated_space:  493, uni_is_vacated_space: 1, is_vacated_space: 1
 865 hour: 17, uni_parked_cars:  14, parked_cars:   6, uni_vacated_space:  186, vacated_space:  494, uni_is_vacated_space: 1, is_vacated_space: 1
 875 hour: 17, uni_parked_cars:  14, parked_cars:   5, uni_vacated_space:  186, vacated_space:  495, uni_is_vacated_space: 1, is_vacated_space: 1
 885 hour: 17, uni_parked_cars:  14, parked_cars:   4, uni_vacated_space:  186, vacated_space:  496, uni_is_vacated_space: 1, is_vacated_space: 1
 895 hour: 17, uni_parked_cars:  14, parked_cars:   3, uni_vacated_space:  186, vacated_space:  497, uni_is_vacated_space: 1, is_vacated_space: 1
 905 hour: 17, uni_parked_cars:  14, parked_cars:   2, uni_vacated_space:  186, vacated_space:  498, uni_is_vacated_space: 1, is_vacated_space: 1
 915 hour: 18, uni_parked_cars:  14, parked_cars:   2, uni_vacated_space:  186, vacated_space:  498, uni_is_vacated_space: 1, is_vacated_space: 1
 925 hour: 18, uni_parked_cars:  13, parked_cars:   2, uni_vacated_space:  187, vacated_space:  498, uni_is_vacated_space: 1, is_vacated_space: 1
 935 hour: 18, uni_parked_cars:  12, parked_cars:   2, uni_vacated_space:  188, vacated_space:  498, uni_is_vacated_space: 1, is_vacated_space: 1
 945 hour: 18, uni_parked_cars:  11, parked_cars:   2, uni_vacated_space:  189, vacated_space:  498, uni_is_vacated_space: 1, is_vacated_space: 1
 955 hour: 18, uni_parked_cars:  11, parked_cars:   1, uni_vacated_space:  189, vacated_space:  499, uni_is_vacated_space: 1, is_vacated_space: 1
 965 hour: 18, uni_parked_cars:  11, parked_cars:   0, uni_vacated_space:  189, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1015 hour: 19, uni_parked_cars:  11, parked_cars:   0, uni_vacated_space:  189, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1025 hour: 19, uni_parked_cars:  10, parked_cars:   0, uni_vacated_space:  190, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1035 hour: 19, uni_parked_cars:   9, parked_cars:   0, uni_vacated_space:  191, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1045 hour: 19, uni_parked_cars:   8, parked_cars:   0, uni_vacated_space:  192, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1115 hour: 20, uni_parked_cars:   8, parked_cars:   0, uni_vacated_space:  192, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1125 hour: 20, uni_parked_cars:   7, parked_cars:   0, uni_vacated_space:  193, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1135 hour: 20, uni_parked_cars:   6, parked_cars:   0, uni_vacated_space:  194, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1145 hour: 20, uni_parked_cars:   5, parked_cars:   0, uni_vacated_space:  195, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1215 hour: 21, uni_parked_cars:   5, parked_cars:   0, uni_vacated_space:  195, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1225 hour: 21, uni_parked_cars:   4, parked_cars:   0, uni_vacated_space:  196, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1235 hour: 21, uni_parked_cars:   3, parked_cars:   0, uni_vacated_space:  197, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1245 hour: 21, uni_parked_cars:   2, parked_cars:   0, uni_vacated_space:  198, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1315 hour: 22, uni_parked_cars:   2, parked_cars:   0, uni_vacated_space:  198, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1325 hour: 22, uni_parked_cars:   1, parked_cars:   0, uni_vacated_space:  199, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1335 hour: 22, uni_parked_cars:   0, parked_cars:   0, uni_vacated_space:  200, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1415 hour: 23, uni_parked_cars:   0, parked_cars:   0, uni_vacated_space:  200, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1515 hour: 24, uni_parked_cars:   0, parked_cars:   0, uni_vacated_space:  200, vacated_space:  500, uni_is_vacated_space: 1, is_vacated_space: 1
1525 hour:  8, uni_parked_cars:   0, parked_cars:   0, uni_vacated_space:  500, vacated_space:  200, uni_is_vacated_space: 1, is_vacated_space: 1
```

ب)

برای سنتز، فایل وریلاگ را در برنامه‌ی کوارتوس کامپایل می‌کنیم و با ابزار TimeQuest Timing Analyzer، سقف نرخ کلاک را حدود ۲۶ مگاهرتز به‌دست می‌آوریم.

Fmax Summary

	Fmax	Restricted Fmax	Clock Name	Note
1	26.77 MHz	26.77 MHz	clk	

علت این نرخ پایین، می‌تواند وجود عملیات پیچیده در هر چرخه کلاک باشد؛ مانند بررسی شرط با استفاده از باقی‌مانده گرفتن، جمع و تفریق و به‌روزرسانی مقادیر رجیسترها در تنها یک چرخه کلاک.