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PES UNIVERSITY

PES University, Bengaluru

(Established under Karnataka Act No. 16 of 2013)

UE14EE316

END SEMESTER ASSESSMENT B.Tech 5th Semester

UE14EE316 – Digital System Design Using VHDL

Time: 3 Hrs | Answer All Questions | Max Marks: 100

1.	a)	With an example briefly explain the differences between std_logic_vector and bit_vector types in VHDL.	5M
	b)	Write the structural VHDL program to instantiate the 2-input NOR gate component twice in a design with the following specifications using generics. (i) rise_time = 5ns, fall_time = 2ns (ii) rise_time = 10ns, fall_time = 4ns	5M
	c)	Write the Structural VHDL Program for the following: (i) Half-Adder using EX-OR and AND gate as components. (ii) 2:4 Decoder using basic gates as components.	10M
2.	a)	With an example briefly explain signal assignment and variable assignment statements in VHDL.	5M
	b)	Write a behavioral description of D Flip-Flop which changes state on the rising edge of clock input and also consider the propagation delay of Flip-Flop is 10ns.	5M
	c)	Write a behavioral description in VHDL for the following; (i) 4:2 priority Encoder using if-else condition statements. (ii) To count number of ones in a given 8-bit data using 'FOR' loop statement.	10M
3.	a)	Write a VHDL snippet to add two bit_vectors of data using a procedure.	5M
	b)	With a neat block diagram, explain the operation of serial adder with accumulator.	5M
	c)	For the given state graph of binary multiplier control, write the behavioral model for 4 X 4 unsigned binary multiplier.	10 M

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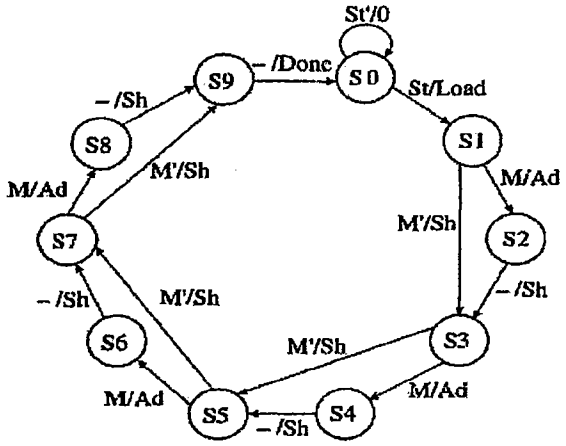
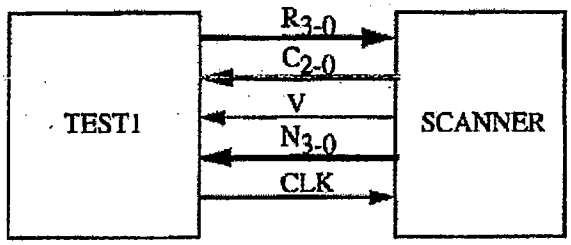


4.	a)	**Construct an SM chart for the Dice Game Test module and write the VHDL program for the same assuming the appropriate signals.**	**10M**
	b)	**Draw an SM Chart for the control circuit of Dice Game by considering appropriate signals.**	**10 M**
5.	a)	**Write the VHDL test bench program considering the two components SCANNER and TEST1 with the appropriate signals as shown in the figure for the keypad scanner.** 	**10M**
	b)	**Draw the Finite State Graph for the sequential traffic light Controller. With the following specifications.** • **Intersection of "A" street (main) and "B" street** • **Each street has traffic sensors, which detect the presence of vehicles approaching or stopped at the intersection.** • **Sa = 1 means a vehicle is approaching on "A" street, and Sb = 1 means a vehicle is approaching on "B" street.** • **"A" street is a main street and has a green light until a car approaches on "B". Then the light changes, and "B" has a green light.** • **The green "A" light will stay on for 6 clock cycles (60 seconds) and then change to yellow if a car is waiting on "B" street.** • **Three of the outputs (Ga, Ya, and Ra) drive the green, yellow, and red lights on "A" street. The other three (Gb, Yb, and Rb) drive the corresponding lights on "B" street.**	**10 M**