

### Note:

- Maximum marks: 07
- Deadline: 25-09-2025
- Data-dominated design, VIO based
- Select the question based on your ID number, consider the last digit of your ID, and add a 1 with it. Then divide it by 2 and find the ceiling function to get an integer. For example, if the ID is 2025H1230950G. The last digit is 0, add a 1 = 1, and then divide by 2=0.5. The ceiling function would return = 1, so the question is Q1.

### **Q1. Square root of a number**

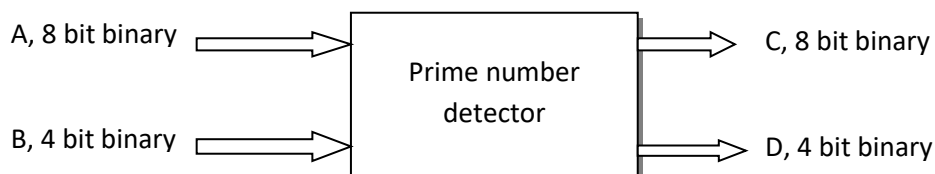
1. You may consider any algorithm for finding the square root of a 32-bit signed or unsigned fixed-point number. The output may be represented in 16.16 format (16 integer and 16 fractional bits)
2. Use VIO IP core for debugging and verification
3. The square root has to be implemented using HDL, you are not supposed to use the IP cores

### **Q2. Division of a number**

1. You may consider any algorithm for dividing 16-bit signed or unsigned numbers.
2. Consider only fixed-point numbers and the output may be represented in 16.16 format (16 integer and 16 fractional bits).
3. Use VIO IP core for debugging and verification
4. The divide operation has to be implemented using HDL, you are not supposed to use the IP cores

### **Q3. Prime number detector**

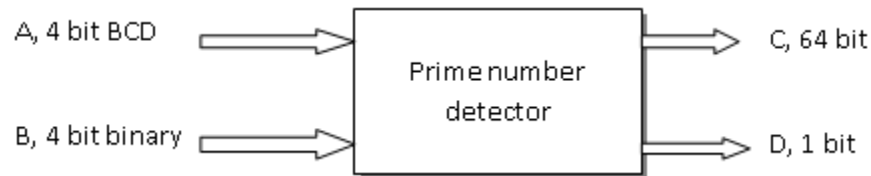
1. The prime number detector (DUT) has two inputs and two outputs as shown in the figure. A is the data input and B is the number of inputs to be applied. C is the detected prime numbers and D is the number of prime numbers detected.



2. All the inputs and outputs are integer binary.
3. Use VIO IP core for debugging and verification. Use VIO for IOs B and D. Supplying A input values in sequence and observing C output in sequence can be done by any method.
4. The prime number detector has to be implemented using HDL

#### Q4. Palindromic number

1. The palindromic number detector (DUT) has two inputs and two outputs as shown in the figure. A is the data input in BCD receiving each digit in sequence and B is the number of digits in the input. D is 1 if the input is a palindromic number and C is the detected palindromic number.



2. Use VIO IP core for debugging and verification. Use VIO for IOs B, C, and D. Supplying A input values in sequence can be done by any method.
3. The palindromic number detector has to be implemented using HDL

**Note: How to apply the inputs sequentially for the above two questions: use MUX and each of the MUX inputs can be supplied by the VIO. Select lines of the MUX are driven by a 4-bit counter. The B input is also given by the VIO. The detector considers “B” number of data from the A input.**

#### Q5. Fixed Point Cube Root

1. You may consider any algorithm for finding the cube root of a 32-bit signed or unsigned fixed-point number. The output may be represented in 16.16 format (16 integer and 16 fractional bits)
2. Use VIO IP core for debugging and verification
3. The square root has to be implemented using HDL, you are not supposed to use the IP cores

Answer yourself: the algorithm used, what is the resource consumed, what is the latency and throughput of the design, etc.