**Assessment Task 1:**

**Scenario:** You are to design synchronous and asynchronous circuits that will allow the following requirements to be met.

**Tasks:**

1. Packet number checking

A synchronous sequential machine is to have a single input line and a single output line. The circuit is to receive messages of 4-bit words coded in binary (least significant bit first). The purpose of the circuit is to detect whether the number coming in is a prime number (divisible by only itself and 1). Thus, the output is to become 1 whenever a 4-bit word does represent a valid prime number. At the end of each word the machine is to return to the reset starting state.

Steps:

1. Draw a State Diagram (Mealy) and check for redundancies
2. Then assign binary State Identifiers.

3) Make a Next State Truth Table (NSTT)

4) Select a bistable type

5) Determine expressions for the bistable inputs

6) Determine expressions for the outputs

2. Monitoring System

A monitoring system sends 1μs positive going pulses to a device to ensure that it is operating correctly. The device will respond by lowering its normally high line as soon as it receives the pulse then raising the line again within the 1μs if working correctly. If the device line doesn’t respond correctly or respond at all then an alarm must occur.

1. Carry out a design for the asynchronous system that will realise the requirements up to the point where internal conditions are designated to the lines in the merged table.

Explain what the designer would have to do to ensure the system was hazard free and the output was as short as possible.

**Assessment Task 2:**

Scenario

With the complexity of modern simulation and analysis computer packages it is possible to design, modify designs and analyse complex circuits without the need for ordering components and the associated delays in such processes. You are required to design a circuits whose specification is detailed below.

Task 1

A level transducer has a non-linear relationship between its level input 0 – 10 m and its output voltage 0 – 10v.

A non-linear amplifier is required to correct for the non-linearity and you must submit a design for this.

Select the number of “stages” required and justify this in your solution.

|  |  |
| --- | --- |
| Input Level (m) | Vout (volt) |
| 0.00 | 0.00 |
| 0.50 | 1.69 |
| 1.00 | 2.89 |
| 1.50 | 3.82 |
| 2.00 | 4.58 |
| 2.50 | 5.22 |
| 3.00 | 5.78 |
| 3.50 | 6.27 |
| 4.00 | 6.71 |
| 4.50 | 7.11 |
| 5.00 | 7.47 |
| 5.50 | 7.81 |
| 6.00 | 8.12 |
| 6.50 | 8.40 |
| 7.00 | 8.67 |
| 7.50 | 8.92 |
| 8.00 | 9.16 |
| 8.50 | 9.39 |
| 9.00 | 9.60 |
| 9.50 | 9.81 |
| 10.00 | 10.00 |

Task 2

Reflect on the use of Electronic Computer Aided Design Software with particular reference to:

Where it can be used – list possible uses?

What are its strengths and advantages over building an actual circuit?

What are its weaknesses and disadvantages over building an actual circuit?

Present your findings in the form of a well-structured and detailed report.