INFORMATICS INSTITUTE OF TECHNOLOGY

Course: Foundation Certificate in Higher Education

Unit Code and Description: DOC325 - Digital Circuits and Logic Design

Lecturer: Ms. Keerthiga Rajenthiram

Assignment Number: 01 **Assignment Type:** Group

Issue Date: 8th November 2022

Submission date & time: on or before 28th of November 2022,12.00 pm noon.

Group ID:

Student Number	Student Name

Submission Instructions:

- The assignment must be submitted to the link on the DOC325 module page in the IIT LMS.
- You must submit the document in PDF format and the name of the document should be **DOC325_Assignment_<Group ID>** (e.g.: DOC325_Assignment_Group_01.pdf).
- Only **ONE** report should be submitted by each group on or before the deadline.

Penalties for Late Hand In

If students submit coursework late but within 24 hours of the specified deadline, the work will be marked but 10 marks will be deducted.

If students submit coursework more than 24 hours after the specified deadline, they will be given a mark of zero for this assessment.

Exceptional Factors Affecting your Performance

Students must follow the mitigation process and should submit written evidence to the Registrar's Department with a copy to the Level Coordinator of exceptional circumstances, which they consider having caused them to submit assessments late and for which they do not wish to attract any penalty.

Assignment in Brief

You have to complete all the questions below and submit the answers as one report. You are expected to work as a group in finding the answers. The viva sessions will be scheduled from 29th November onwards.

Question 1 – 50 marks

Combinational Logic Circuits are made up of basic logic gates that are "combined" or connected together to produce more complicated switching circuits.

1. Describe a real-world problem or scenario that can be solved using a combinational circuit. You must think of a creative product/problem to solve by building a circuit. There should be a minimum of 4 inputs and 2 outputs. (8 marks)
2. Define the inputs and outputs and assign Boolean variables. (5 marks)
3. Draw the truth table for the defined problem. (7 marks)
4. Express the outputs in SOP and POS form. (4 marks)
5. Simplify the expression from the truth table using both K-Maps and Boolean Algebra Laws. (10 marks)
6. Draw the logic circuit for the simplified expression. (6 marks)
7. Simulate the logic circuit using any simulator software (E.g., logic.ly and circuitverse.org) (10 marks)

Question 2 – Encoder/Decoder – 30 marks

Encoders and Decoders are a type of combinational circuits used in Data Transmission.

1. Draw the Schematic diagram and Truth Table for the 16x4 encoder and decoder. (10 marks)
2. Simplify the expressions for the outputs in encoder and decoder. (10 marks)
3. Simulate the circuits for the encoder and decoder. (10 marks)

Question 3 – 20 marks

1. A Full Adder can be implemented using multiple Half Adders. Using a suitable simulation, show how this could be achieved and explain how it works. (10 marks)

2. A set of Full Adders can be used to implement an adder which can add two 6-bit binary numbers. These types of adders are also called ‘Ripple Carry Adders’. Using a suitable simulation, show how this could be achieved and explain how it works. (10 marks)