

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

BACHELOR OF ENGINEERING (HONS) DEGREE

Final Examination

Digital Devices and Systems

May 2013

TEE 2211

Duration of Examination 3 Hours

INSTRUCTION TO CANDIDATES

1. Answer any **four** questions only
 2. All questions carry equal marks
 3. Show all your steps in your calculations clearly
 4. Start the answer for each question on a fresh page
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Question 1

- a) State the difference between combinational logic systems and sequential logic systems.
[3 marks]
- b) For a full adder to be functional, two half adders can be connected together. With the help of a diagram describe how these two can be connected.
[15 marks]
- c) Explain hazards (or glitches) in logic circuit and how they can be dealt with using flip flops.
[7 marks]

Question 2

- a) Design an asynchronous counter that can be implemented to count down from 7 to 0 using T type flip flops and show the timing waveforms.
[15 marks]

- b) Using the appropriate logic functions and diagrams, explain how a seven segment display driver can be used to display numbers 0 to 9 on a common anode display.

[10 marks]

Question 3

- a)
- i. When a large number of Full Adders are cascaded together, an effect occurs. Discuss the ripple carry and its effect.

[5 marks]

- ii. Suggest one method this might be solved

[10 marks]

- b) Different types of memory are implemented in computer systems. In particular, the random access memory (RAM) and the read only memory (ROM). Define the following terms,

- i. Static RAM memory
- ii. Dynamic RAM memory

[4 marks]

- c) With aid of a circuit, show how programmable logic arrays (PLA) can be programmed to implement a 4 bit BCD to 4 bit Gray code. Show the appropriate joints at the inputs and outputs as well as the truth table and equations used.

[6 marks]

Question 4

- a) Using block diagrams, distinguish between the Moore and Mealy Machine in Finite State Machines.

[10 marks]

- a) Shift register can be used to store numbers. Design a load/shift circuit and explain how it works.

[15 marks]

Question 5

- a) Sequential systems can be divided into synchronous and asynchronous circuits. Distinguish the two and give examples of their applications. [10 marks]
- b) With the use of a state diagram and table, design a 3 bit up/down counter. [10marks]
- c) How many flip flops are required to count from 0 to 2015? [5 marks]

END OF QUESTION PAPER