



**TECHNICAL UNIVERSITY OF MOMBASA**

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**FACULTY OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MEDICAL ENGINEERING**

**UNIVERSITY EXAMINATION FOR:**

**DIPLOMA IN MEDICAL ENGINEERING**

**EHL 2204: DIGITAL ELECTRONIC**

**END OF SEMESTER EXAMINATION**

**SERIES: APRIL 2016**

**TIME: 2 HOURS**

**DATE: 16 May 2016**

**Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

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### Question ONE

- (a) Give reasons why TTL inputs are not left open circuited in industrial circuits. (2marks)
- (b) i) Explain TWO problems of asynchronous counters  
ii) Determine the maximum possible clock input frequency for an 8 bit ripple through counter if the flip-flops have a propagation delay of 20nS (7 marks)
- (c) i) Explain the disadvantage of the GRAY code  
ii) Illustrate how a 4-bit Gray code can be converted to pure binary using a circuit diagram (6 marks)
- (d) Define the following terms as applied to logic families  
i) Threshold level  
ii) Noise immunity  
iii) Fan in (3 marks)
- (e) With the aid of a diagram explain how you can add two 3-bits numbers using three full adders (6 marks)
- (f) Find the binary equivalents of the following numbers  
i)  $16_{10}$   
ii)  $11_8$   
iii)  $12_{16}$  (6 marks)

### Question TWO

- (a) i) Draw the truth table of a full adder circuit  
ii) Obtain the Boolean expression for the Sum and the Carry  
iii) Minimize the Boolean expression obtained in 2(b) using K-map  
iv) Draw the logic circuit diagram of the full adder (20 marks)

### Question THREE

- (a) i) Explain the even parity error detection method in transmitted information in digital system  
ii) Find the odd parity bit for the following binary message to be transmitted: 101 10000. (5 marks)
- (b) Convert the decimal number 19 to  
i) binary  
ii) Excess-3 BCD (6 marks)
- (c) Perform the following operations  
i)  $(5 - 2)_{10}$  by 2's complement  
ii)  $(2 - 3)_{10}$  by 1's complement  
iii)  $(2355 - 1779)$  by 10's complement

(9 marks)

### Question FOUR

(a) i) Draw a truth table for the circuit shown in figure 2

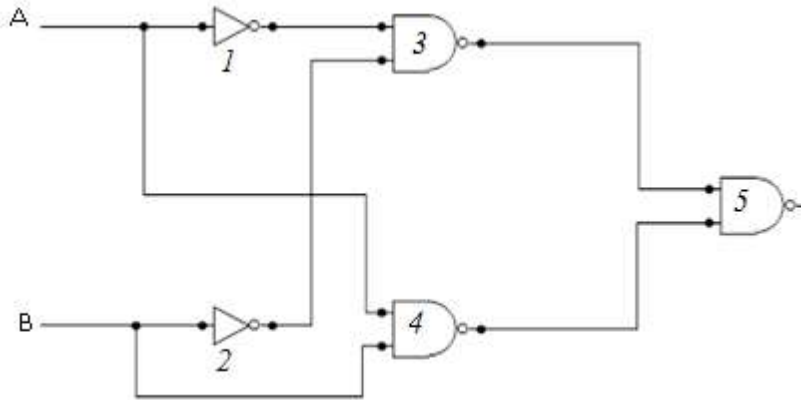


Figure 2

- ii) Name the type of function performed by the circuit in figure 2 (10 marks)
- (b) i) Express  $f = (X + \bar{X}Z)(X + Z)$  using only one two-input OR gate. (10 marks)
- ii) Express  $f = (\bar{A} + \bar{B} + \bar{C}) + \overline{ABC}$  using only one three input AND gate. (10 marks)

### Question FIVE

A three bit counter is used in a traffic control system where logic circuits are used to generate the correct sequence of Red, Amber and Green lights. If the stop and go signals is made to last three times as the intermediate signals.

- (a) i) Draw the truth table of the traffic light control system
- ii) Write the Boolean expressions for each output
- iii) Draw the circuit diagram for the traffic light control system (20 marks)