



GRETSA UNIVERSITY - THIKA

UNIVERSITY EXAMINATIONS MAY - AUGUST 2018 SEMESTER

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: BSCS 105

COURSE TITLE: DIGITAL ELECTRONICS I

DATE: 7 AUGUST 2018

TIME: 3.00 PM – 6.00 PM

INSTRUCTIONS TO CANDIDATES

1. SECTION A IS **COMPULSORY**.
2. SECTION B: ANSWER ANY OTHER **THREE** QUESTIONS.
3. **DO NOT** WRITE ANYTHING ON THIS QUESTION PAPER AS IT WILL BE AN EXAM IRREGULARITY.
4. ALL ROUGH WORK SHOULD BE AT THE BACK OF YOUR ANSWER BOOKLET AND CROSSED OUT.

CAUTION: All exam rooms are under CCTV surveillance during the examination period.

SECTION A: COMPULSORY

Question One

- a) A logic function is expressed as $F(A, B, C) = \prod M(0, 2, 3, 7)$
- Derive the standard POS expression of the function F. [3marks]
 - Draw the K-map for function F. [3marks]
 - Use the K-map and derive the simplified POS expression of the function F. [4marks]
 - Hence or otherwise derive the simplified SOP expression of the same function [3marks]
- a) Compute the following
- $$\begin{array}{r} 1111 \\ + 1101 \\ \hline \end{array}$$
 [3marks]
 - $$\begin{array}{r} 10100 \\ - 10011 \\ \hline \end{array}$$
 [2marks]
- b) Represent the **NAND** Gate in a Truth table. Show clearly the output of the two variables. [5marks]
- c) What is the Binary equivalent of the decimal number 368? [5marks]
- d) Define the following terms
- Logic Gates [2marks]
 - Digitization [2marks]
 - Analog signal [2marks]
 - Product of Sum [2marks]
- e) Evaluate the decimal equivalent of $1A53_{16}$ [4marks]

SECTION B: ANSWER ANY THREE QUESTIONS

Question Two

- a) State the second DE Morgan's theorem and represent the proof in a truth table [5marks]
- b) Describe the Duality principle, stating clearly the steps taken in simplification of a function. [5marks]
- c) Using Truth tables show that $\overline{A+B} = \bar{A}\bar{B}$ [3marks]
- d) Simplify the Boolean Expression $Y = \overline{\overline{ABC}} + \overline{\overline{ABC}}$ [3marks]

- e) Evaluate the 2's complement of 1101101_2 [4marks]

Question three

- a) Construct a Truth table for the following function.

$$Q = AB + \bar{B}C \quad [5marks]$$

- b) Given the Boolean Expression below,

$$Y = A(\bar{B} + BC)$$

- i. Represent the expression in a Logic diagram and truth table. [6marks]
- ii. Use Duality principle to simplify the expression. [6marks]
- iii. Draw the logic diagram for simplified expression. [3marks]

Question Four

- a) Using relevant examples, discuss Numbering system as used in digital electronics.

[4 marks]

- b) Convert the following

i. $5B9C_{16}$ to decimal [5marks]

ii. 35.45_{10} to octal [5marks]

- c) Discrete elements of information are represented in a digital system by physical quantities called *signals*. The most common are the electrical signals such as voltages and currents.

State the three ways these discrete signals can be represented. [6 marks]

Question five

- a) Define a three variable Karnaugh Map and hence use the technique of K-map, simplify the Boolean Function below

$$F(ABC) = \sum_m (0157) \quad [6marks]$$

- b) Discuss the advantages and disadvantages of Analog signals. [4 marks]

- c) Simplify the expression $F(A, B, C) = \bar{A}\bar{B} + B(BC + CB)$ hence draw the logic diagram and truth table. [4 marks]

- d) Use Boolean algebra to minimise the following expressions.

i. $Y = (ABC\bar{C} + \bar{A}BC + \bar{A}BC + ABC\bar{C})$ [3marks]

ii. $F = (x + y).(x + \bar{y} + \bar{z})$ [3marks]