

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF CERTIFICATE IN COMPUTER SCIENCE

COSC 00108: INTRODUCTION TO DIGITAL LOGIC AND DATA COMMUNICATION

STREAMS: CERT COMP SCI.

TIME: 2 HOURS

DAY/DATE: THURSDAY 14/12/2015

2.30 P.M – 4.30 P.M

INSTRUCTIONS:

- Answer question ONE and TWO other questions
- Do not write anything on the question paper
- This is a closed book exam, no reference materials are allowed in the examination room
- There will be NO use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely.

SECTION A

Question one (30 marks)

- a. Give the standard logic symbols and truth tables of the operation of each of the following gates.
 - i. XNOR gate [2marks]
 - ii. XOR gate [2marks]
 - iii. OR gate [2 marks]
- b. Distinguish between combinational circuits and sequential circuits [4 marks]
- c. Define the term bandwidth? [2 marks]
- d. Typically, gates are not sold individually; they are sold in units called integrated circuits (ICs). List three electronic components used to implement various gates [3 marks]
- e. List five components of data communication [5 marks]
- f. Simplify the following functional expression using Boolean algebra and its identities. List identity used at each step [5 marks]

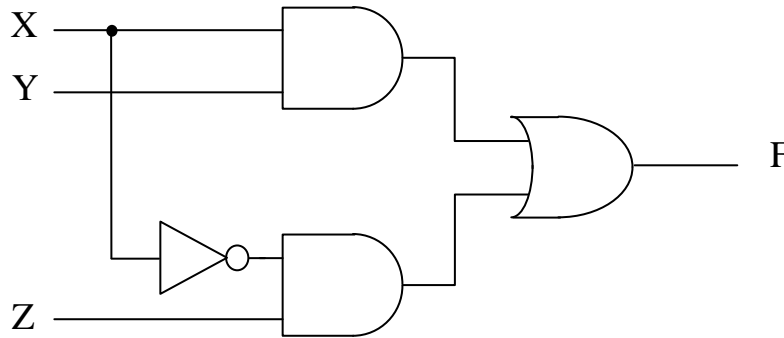
$$F(x, y, z) = \bar{x}y + xy\bar{z} + xyz$$
- g. Using a truth table show that [5 marks]

$$XZ = (X+Y)(X+\bar{y})(\bar{x} + Z)$$

SECTION B

Question Two (20 marks)

- a. Transmission medium through which signals travel is not perfect. This imperfection of medium causes impairment of the signal. Explain three types of transmission impairment [6 marks]
- b. Draw a logic circuit for $(A + B)(C + D) C$. [6 marks]
- c. Draw corresponding truth table of the following logic circuit [8 marks]



Question three (20 marks)

- a. “Errors” can arise in a communication circuit from a variety of causes. Such errors may lead to degradation of the transmitted signal. Thus the receiving end cannot correctly determine what was sent.
 - i. Describe the four error detection methods that can be put in place [8 marks]
 - ii. Describe what can be done to correct errors to maintain data integrity. [8 marks]
- b. Give four differences between analog and digital signal. [4 marks]

Question four (20 marks)

- a. Draw a logic diagram for half adder and its corresponding truth table to demonstrate its operations [10 marks]
- b. With diagrams and truth tables of operations, discuss how street light and security alarm systems work as applications of logic gates. [10 marks]

Question five (20 marks)

- a. Explain the two types of serial transmission [4 marks]
- b. Explain the following concepts in data communication, and give appropriate examples in each case.
 - i. Simplex [3 marks]
 - ii. Half- duplex [3 marks]
 - iii. Full – duplex [3 marks]
- c. Explain jitter and timeliness as characteristics that determine the effectiveness of any data communication system. [4 marks]
- d. Transmission medium can either be wired or wireless, name three wireless transmission medium use in data communication [3 marks]