



UNIVERSITY EXAMINATIONS
SECOND YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF
BACHELOR OF SCIENCE IN PURE MATHEMATICS AND COMPUTING/
BIOMETRY AND INFORMATICS
FIRST SEMESTER 2022/2023
[SEPTEMBER-DECEMBER, 2022]

COMP 201: BASIC CIRCUIT DESIGN

STREAM: Y2S1

TIME: 2 HOURS

DAY: TUESDAY, 3:00 – 5:00 PM

DATE: 06/12/2022

INSTRUCTIONS

- 1. Do not write anything on this question paper.**
- 2. Answer question ONE and any other TWO questions.**

QUESTION ONE

- a. Briefly explain the following terms as used in basic circuit design
- i. Digital system (2marks)
 - ii. Boolean algebra (2marks)
 - iii. Basic latch (2marks)
- b. (i) Explain five characteristics of digital system (5marks)
- (ii) Briefly explain four advantages of digital system over Analog system (4marks)
- c. Discuss the following types of Error – Detecting codes
- i. Parity (3marks)
 - ii. Block parity (3marks)
 - iii. Checksums (3marks)
- e. Simplify $F = x'yz + x'yz' + xz$ (3marks)
- f. Draw a truth table for F1 where $F1 = x + y'z$ (4marks)

QUESTION ON TWO

- a. Explain capabilities of a general shift register. (6marks)
- b. Memory structures are crucial in digital design. Discuss the following types of memories used in basic circuit design.
- (i) PROM (2marks)
 - (ii) EPROM (2marks)
 - (iii) SRAM (2marks)
 - (iv) DRAM (2marks)
- c. Briefly explain how communication is achieved between memory and its environment. (6marks)

QUESTION ON THREE

- a. By the help of a diagram discuss a combinational circuit and list its design procedure. (8marks)
- b. By the help of graphical symbols explain the following types of gates
- i. AND (3marks)
 - ii. OR (3marks)
 - iii. NOR (3marks)
 - iv. NAND (3marks)

QUESTION FOUR

- a. Write short notes on the following:
- i. Decimal numbers (3marks)
 - ii. Binary numbers (3marks)
 - iii. Octal numbers (3marks)
 - iv. Hexadecimal numbers (3marks)
- b. Use two's complement to perform the following arithmetic operation (4marks)
100-50
- c. Differentiate between a full adder and half adder. (4marks)

QUESTION FIVE

- a. Express the Boolean function $F = A + B'C$ as a sum of minterms (4marks)
- b. Express the Boolean function $F = xy + x'z$ as a product of maxterms. (4marks)
- c. (i) List two limitations of Karnaugh maps (2marks)
(ii) Reduce the expression $f=(A+B)(A+B')(A'+B')$ using mapping (5marks)
- d. Prove that $x'y'z' + x'yz' + xyz' = x'z' + yz'$ (5marks)