



COMSATS University Islamabad (CUI)
Islamabad Campus
Department of Electrical Engineering
Terminal Exam

EEE240 Fundamentals of Digital Logic Design
EEE241 Digital Logic Design
BAI 2A, BSE 2A, BAI 5A, BSE 8A

Marks: 100
Date: July 3, 2025

Time: 3 hours
Instructor: M. Tahir Khan

- All rules pertaining to examinations are as per CUI.

Q 1. (Marks = 10 + 10)

- a) Design a sequence detector using Mealy Finite Machine with D flip-flops that detects three or more consecutive 1s in the input serial stream. Show state diagram, state table and logic circuit diagram.
- b) Repeat part a) for Moore Finite Machine.

Q2. (Marks = 10 + 10)

- a) Simplify the following function to SOP form and draw "NAND" logic that implements it?
 $F(A,B,C,D) = \Sigma (0,1,2,3,4,8,9,10,11,12)$
- b) Simplify the following Boolean function to POS form and draw "NOR" logic to implement it?
 $F(A,B,C,D) = \Pi (1,3,5,7,12,13,14,15)$

Q 3. (Marks = 10, 10)

- a. Implement the following function using 8x1 multiplexer and external gates.
 $F(w, x, y, z) = \Sigma(1, 3, 7, 11, 15)$
- b. Using decoders constructed with NAND gates and external gates, design the combinational circuit defined by the following Boolean functions:
 $F_1 = xy'z + x'z'$
 $F_2 = x'yz + xy'$

Q 4. (Marks = 10, 10)

Simplify the following functions using BOOLEAN ALGEBRA and then verify your results with K-Map?

- a) $ABCD + A'CD + BC'D + AB'C'D' + B'CD'$
- b) $xz' + wx'y + w'xy' + w'x'y$

Q 5. (Marks = 7, 7, 6)

- a. Represent the unsigned decimal numbers 9138 and 8191 in BCD?
- b. The following numbers are in signed magnitude form. Find their sum using 10's complement.
 $(-9089)_{10} + (-8902)_{10}$
- c. The numbers $(-64)_{10}$ and $(-37)_{10}$ are in signed magnitude form. Find their sum using 2's complement by first converting them into binary.

Best of Luck!