

TUNKU ABDUL RAHMAN UNIVERSITY OF MANAGEMENT AND TECHNOLOGY

FACULTY OF ENGINEERING AND TECHNOLOGY

ACADEMIC YEAR 2024/2025

JANUARY EXAMINATION

AGEH1363 INTRODUCTION TO DIGITAL ELECTRONICS

MONDAY, 13 JANUARY 2025

TIME: 9.00 AM - 11.00 AM (2 HOURS)

DIPLOMA OF ELECTRONIC ENGINEERING

DIPLOMA OF MECHATRONIC ENGINEERING

Instructions to Candidates:

Answer **ALL** questions.

All questions carry equal marks.

AGEH1363 INTRODUCTION TO DIGITAL ELECTRONICS**Question 1**

- a) Explain analog and digital signals within the framework of digital electronics. (4 marks)
- b) Figure Q1 shows a combinational logic circuit. Write the expression for the output in Figure Q1. (5 marks)

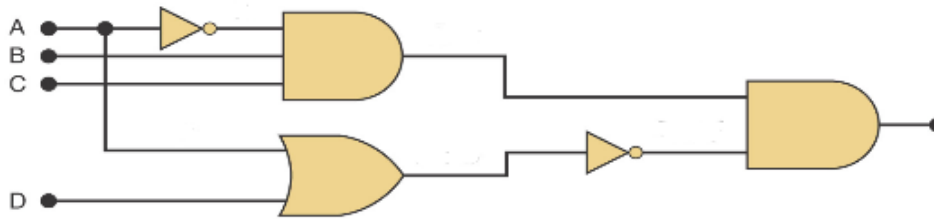


Figure Q1

- c) Simplify the the following expression using the appropriate theorems. (8 marks)
- $$X = A\bar{B}\bar{C} + A\bar{B}C + ABC$$
- d) Construct the logic circuit using minimum number of logic gates based on the simplified output expression obtained in Q1(c). (8 marks)
- [Total: 25 marks]

Question 2

A logic circuit is required to count the number of zeros in a 3-bit input (A, B and C) and outputs the results as a 2 bit binary number (U and V).

- a) Provide the truth table for this circuit. (8 marks)
- b) Determine the simplest sum-of-product expression for output U and V using Karnaugh map. (10 marks)
- c) Construct the logic circuit for the expression U using basic logic gates. (7 marks)
- [Total: 25 marks]

AGEH1363 INTRODUCTION TO DIGITAL ELECTRONICS**Question 3**

- a) Explain what a multiplexer is. (2 marks)
- b) List **THREE** applications of multiplexer in digital systems. (3 marks)
- c) A logic circuit has the following Boolean function:
- $$F = \bar{X}\bar{Y}Z + \bar{X}Y\bar{Z} + XY\bar{Z} + XYZ$$
- (i) List the truth table for the stated function. (8 marks)
- (ii) Implement the logic function using an 8-to-1 multiplexer. (6 marks)
- (iii) Implement the logic function using a 4-to-1 multiplexer. (6 marks)
- [Total: 25 marks]

Question 4

- a) Distinguish between a decoder and encoder. (8 marks)
- b) Draw the block diagram of a 2-to-4 decoder. (3 marks)
- c) Construct a truth table for the 2-to-4 decoder. (6 marks)
- d) Implement the 2-to-4 decoder using logic gates. (8 marks)
- [Total: 25 marks]