



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2013/2014

STAGE 4, EXAMINATION FOR DIPLOMA/CERTIFICATE IN INFORMATION TECHNOLOGY

### DIT 0409: INTRODUCTION TO DIGITAL ELECTRONICS

DATE: APRIL 2014

TIME: 1½ HOURS

INSTRUCTIONS: Answer questions *one* and any other *two* questions

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#### QUESTION ONE - (30 MARKS)

- a) Differentiate between digital and analogue systems. (2 marks)
- b) Convert the following decimal numbers into their BCD equivalent: (3 marks)
- i. 31
  - ii. 245
  - iii. 7
- c) i) What is a sound transducer? (1 mark)
- ii) Give two examples of a sound transducer. (2 marks)
- d) Draw the standard logic symbols for the following gates: (2 marks)
- i. NOR
  - ii. AND
- e) What is the output of the simple logic network shown below?

(3 marks)

- f) (i) Convert the Boolean expression  $A\bar{B}+C$  into a logic circuit using different logic gates. (3 marks)
- (ii) State three applications of logic gates. (3 marks)
- g) What is an LED? (2 marks)
- h) State any three uses of an LED. (3 marks)
- i) Simplify the following Boolean expressions:
- i.  $F = A + B + 1$  (2 marks)
  - ii.  $F = (A + B) . 1$  (1 mark)
  - iii.  $F = A + B . 1$  (1 mark)
  - iv.  $F = A + AB$  (2 marks)

### QUESTION TWO (15 MARKS)

- a) Perform the following binary additions:
- i.  $1011 + 1001$  (2 marks)
  - ii.  $1011.01 + 1001.11$  (2 marks)
- b) Find the 1's complements of the following binary numbers: (3 marks)
- i. 01101
  - ii. 1101
  - iii. 1001
- c) Use the 1's complement method to perform the following binary subtractions:
- i.  $1111 - 1011$  (3 marks)
  - ii.  $100011 - 111010$  (3 marks)
- d) Carry out the binary division  $11001 / 101$  (2 marks)

### QUESTION THREE (15 MARKS)

- a) Simplify the following Boolean function using Boolean algebra. (3 marks)

$$X = A + \bar{A}B + \bar{A}\bar{B}$$

- b) Use truth tables to prove the following Boolean identities.
- i.  $AB + A\bar{B} = A$  (3 marks)
  - ii.  $\bar{A} + AB = \bar{A} + B$  (4 marks)
- c) The figure below shows a three –variable Karnaugh map. Group the 1s and hence obtain the minimized Boolean expression. (4 marks)

(d) What is  $\overline{(A + B)}$  simplified? (1 mark)

**QUESTION FOUR – (15 MARKS)**

a) What is a transducer? (2 marks)

b) Briefly describe any two named temperature transducers. (4 marks)

c) Briefly describe an LDR. (3 marks)

d) Shown below is a fire alarm circuit:

Describe how it operates. (6 marks)

**QUESTION FIVE (15 MARKS)**

- a) Briefly describe the following terms in relation to computer memory:- (6 marks)
- i. Bit
  - ii. Byte
  - iii. Nibble
  - iv. Word
  - v. Data address
- b) What is a register? (2 marks)
- c) Briefly describe any two types of register. (4 marks)
- d) Describe any three characteristics of Read Only Memory (ROM) (3 marks)