



MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

EED 205: DIGITAL ELECTRONICS I

DATE: 30/5/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

1. You should have an examination booklet for this examination
2. Question ONE (1) is compulsory
3. Answer ANY other TWO questions.
4. Maximum marks for each part of a question are as shown.

1. a) (i) Convert the following numbers as instructed:

- 321_8 to binary;
- $AE3_{16}$ to decimal.

(ii) Perform the following operations:

- Add BCD numbers 10 and 12;
- Convert gray code 1001010011 to binary. (10 marks)

b) (i) Using Boolean theorems, simplify the following boolean expression;

$$A.C + A.\bar{C} + \bar{A}.B + B.\bar{B} + A\bar{A} \quad (5 \text{ marks})$$

- (ii) Use K-Map to simplify the following the following;

$$\bar{W}\bar{X}\bar{Y}\bar{Z} + WXYZ + WX\bar{Y}\bar{Z} + W\bar{X}\bar{Y}Z + \bar{W}\bar{X}YZ + \bar{W}XYZ + W\bar{X}YZ + WXYZ$$

(5 marks)

- c) (i) State ANY four combinational logic circuits. (4 marks)
- ii) With an aid of a truth table, verify that $K.(T + S) = K.T + K.S$ (6 marks)
2. a) (i) Express the following decimal number into 8421 BCD; (9871)₁₀ (2 marks)
- (ii) Using the 8421 BCD arithmetic, perform the following operation of decimal numbers $213 + 109$ (4 marks)
- (iii) Express the following XS₃ number in decimal; 101111001 (2 marks)
- (iv) Perform the following conversions;
- 11010100011 binary to gray code
 - 11100000 BCD to XS – 3
- (3 marks)
- b) (i) State Demorgans Theorem (2 marks)
- (ii) Draw the truth tables of the **seven** logic gates used in digital systems. (7 marks)
3. a) With the aid of a truth table and a block diagram describe the operation of a full adder circuit (10 marks)
- b) Using the truth table of Q.3(a) prove the formula for sum (S) and carry (C_o) . (6 marks)
- c) Simplify using K map the following Boolean expression;
- $$f(A,B,C,D) = \sum(0,1,2,3,4,5,6,7,8,9,12,13)$$
- (4 marks)
4. Design a binary to gray code decoder. (20 marks)
5. Obtain a minimum SOP expression for the function $F(A,B,C,D,E) = \sum(3,4,7,9,11,12,15,16,18,19,20,23,24,26,27,28,31)$ Using tabular method. (20 marks)