



MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR CERTIFICATE IN
ELECTRICAL AND ELECTRONICS ENGINEERING

EPC 117: DIGITAL ELECTRONICS

DATE: 5/6/2017

TIME: 2:00 – 4:00 PM

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) State two advantages of using binary number system as compared to denary number system. (2 marks)
(ii) Perform the following conversions;
 - 110_2 to decimal;
 - $ABCD_{16}$ to decimal;
 - 23_{10} to binary;
 - 736_8 to octal;
 - 110001111001_2 to octal. (10 marks)
- b) Using Boolean theorems, simplify the following boolean expression;
$$A.C + A.\bar{C} + \bar{A}.B + \bar{A}.A$$
 (10 marks)
- c) With an aid of a truth table, prove that $M.(X + Y) = M.X + M.Y$ (8 marks)

2. a) (i) Express the following decimal number into 8421 BCD;
 $(135)_{10}$ (4 marks)
- (ii) Using the 8421 BCD arithmetic, perform the following operation of decimal numbers $13 + 9$ (6 marks)
- (iii) Express the following XS₃ number in decimal;
 1111010 (4 marks)
- (iv) Perform the following conversions;
 i. 11011 binary to gray code
 ii. 11001100 BCD to XS – 3 (6 marks)
3. Compute the following binary arithmetic operations;
- $110000 + 11111 + 110001$
 - 111×110
 - $1111 \div 101$
 - $1101 - 1010$ using 1's complement
 - $1110 - 1001$ using 2's complement (20 marks)
4. a) State Demorgans Theorem (2 marks)
- b) Draw the truth tables of any **six** logic gates used in digital systems (18 marks)
5. a) Simplify using K map the following Boolean expressions;
- $f(A,B,C,D) = \sum(0,1,2,3,4,5,6,7,8,9,12,13)$
 - $D = ABC + A\bar{B}C + AB\bar{C} + \bar{A}BC$ (20 marks)