



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

**SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND
ELECTRONIC ENGINEERING**

EED215: DIGITAL ELECTRONICS II

Date: 5/8/2016

Time: 8:30 – 10:30 AM

INSTRUCTIONS

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

QUESTION ONE COMPULSORY (30 Marks)

1. a) (i) State Demorgans Theorem. (2 marks)
- (ii) Define the following terms;
- Flip Flop
 - Counter
 - Register (6 marks)
- (iii) State TWO applications of decoders (2 marks)
- b) With the aid of waveforms, design a Mod. 10 UP- ripple counter. (10 marks)
- c) (i) Draw the symbol of a S-R flip flop. (2 marks)
- (ii) With the aid of a logic diagram and truth table, describe the operation of a clocked D flip flop. (8 marks)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS

2. a) An alarm system is needed to maintain three boilers in an industrial plant. Three sensors monitor water level (A), Temperature (B) and pressure (C).
- The system provide a high signal that can be connected to a buzzer, if the water level is low and the temperature is too high, or if the water level is low and the pressure is too high, or if the water level is low and the temperature and the pressure is too high, if the water level is high and the temperature or pressure is too high.
- (i) Draw a truth table to represent the system conditions.
- (ii) Write down the Boolean expression for the alarm system and simplify it using a K-Map.
- (iii) Design a logic circuit to implement the system. (10 marks)
- b) With the aid of waveforms, design a Modulo 12 UP- ripple counter. (10 marks)
3. a) With the aid of a MOS RAM cell (SRAM) circuit, explain its operation. (10 marks)
- b) (i) Differentiate between volatile and non-volatile memory. (4 marks)

- (ii) A memory used in an electronic equipment has a capacity of $16K \times 8$, calculate;
- The number words in this memory
 - Number of bits in each word (word length)
 - Total number of memory cell in the memory. (6 marks)
4. a) State the operational differences between synchronous and asynchronous counters. (2 marks)
- b) A 4-bit counter has a propagation delay time(t_{pd}) of 50nS for each flip flop and a propagation delay time (t_{pd}) of 20nS for each AND gate used.
- (i) Determine the maximum frequency (f_{max}) when the counter is connected as;
- Synchronous counter
 - Ripple counter. (6 marks)
- (ii) Compare the results in (b) (i) above. (2 marks)
- c) (i) Draw the logic circuit diagram of a 5-bit twisted ring counter
- (ii) Determine the code groups and auxiliary states of (c) (i) above. (10 marks)
5. a) Define the following memory terminologies;
- Memory cell
 - Memory word
 - Word size
 - Memory address
 - Access time. (10 marks)
- b) A microcomputer uses the following memories starting from address location 0000H;
- Two 2K ROM
 - Two 4K RAM

Sketch the memory map for this microcomputer. Let the ROM start at location 0000H and the RAM start location 4000H. (10 marks)