



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EED 215: DIGITAL ELECTRONICS II

DATE: 13/11/2020

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer Question One and any Other Two Questions

QUESTION ONE COMPULSORY (30 MARKS)

- a) Define the following terms;
 - i. Sequential Logic Circuit
 - ii. Flip Flop
 - iii. Counter
 - iv. Register (8 marks)
- b) State TWO applications of counters (2 marks)
- c) With the aid of waveforms, design a Mod. 12 UP- ripple counter. (10 marks)
- d)
 - 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)

QUESTION TWO (20 MARKS)

- a) With the aid of a logic diagram, design a 4 – bit up/down ripple through counter. (10 marks)
- b) With the aid of waveforms, design a Modulo 13 ripple counter. (10 marks)

QUESTION THREE (20 MARKS)

- a) With the aid of a MOS RAM cell (SRAM) circuit, explain its operation. (10 marks)
- b) Differentiate between volatile and non-volatile memory. (4 marks)
- c) A memory used in an electronic equipment has a capacity of $16K \times 8$, calculate;
 - i. The number words in this memory
 - ii. Number of bits in each word (word length)
 - iii. Total number of memory cell in the memory. (6 marks)

QUESTION FOUR (20 MARKS)

- 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.
Determine the maximum frequency (f_{max}) when the counter is connected as;
 - i. Synchronous counter
 - ii. Ripple counter.
 - iii. Compare the results in (b) (i) above. (8 marks)
- c) i Draw the logic circuit diagram of a 5-bit twisted ring counter (4 marks)
- ii Determine the auxiliary states of (c) (i) above. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Define the following memory terminologies;
 - i. Memory cell
 - ii. Memory word
 - iii. Word size

- iv. Memory address
 - v. Access time. (10 marks)
- b) A microcomputer uses the following memories starting from address location 0000H;
- i. Two 2K ROM
 - ii. Two 4K RAM
- c) Sketch the memory map for this microcomputer. Let the ROM start at location 0000H and the RAM Start at location 4000H. (10 marks)