



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

EED 215: DIGITAL ELECTRONICS II

DATE: 25/3/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer Question One and any Other Two Questions

QUESTION ONE COMPULSORY (30 Marks)

- a) i Name TWO examples of sequential logic circuits. (2 marks)
- ii Define the following terms;
- Flip Flop
 - Counter
 - Register (6 marks)
- iii State the difference between a sequential circuit and a combinational circuit (2 marks)
- b) With the aid of waveforms, design a Mod. 12 UP- ripple counter. (10 marks)
- c) i Draw the symbol of a J-K flip flop. (2 marks)
- ii Define the following memory terminologies;
- Memory capacity
 - Firmware
 - Cycle time
 - Memory address (8 marks)

QUESTION TWO (20 MARKS)

- a) With the aid of a logic diagram and truth table, describe the operation of;
- Clocked S-R flip flop
 - T flip flop
- (18 marks)
- b) Draw the symbols for each of the above flip flops in question 2(a). (2 marks)

QUESTION THREE (20 MARKS)

- 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)

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;
 - Synchronous counter
 - Ripple counter. (6 marks)
 - 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 auxiliary states of (c) (i) above. (10 marks)

QUESTION FIVE (20 MARKS)

- a) State the difference between FEPROM and EAPROM memories. (4 marks)
- b) With the aid of symbols and truth tables, explain the difference between an ordinary buffer and a tristate buffer. (6 marks)
- c) A microcomputer uses the following memories starting from address location 0000H;
- Two 1K ROM
 - Two 2K RAM

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