



MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE
IN MATHEMATICS AND COMPUTER SCIENCE

SCO 106: ELECTRONICS

DATE: 30/5/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

Answer all questions in section A and any two questions from section B

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) A battery with an emf (voltage) of 1.5V is connected with resistors $R_1 = 4$ ohms and $R_2 = 5$ ohms. Find the current through the circuit and voltage drop across each resistor when:
- (4 marks)
- i Resistors are connected in series
 - ii Resistors are connected in parallel
- b) Use a Karnaugh map to simplify the equation $F = \sum(0, 2, 4, 5, 6, 7, 8)$ with don't cares $X = \sum(12, 13, 14, 15)$ and implement the circuit (8 marks)
- c) Discuss the three types of flip-flop triggering (6 marks)
- d) Discuss the operation of counters as a memory component (6 marks)
- e) Using block diagrams, explain operations of the following logic circuits (6 marks)
- (i) 3-to-8 line decoder
 - (ii) 4 x 1 Multiplexer

QUESTION TWO (20 MARKS)

- a) Implement a circuit that takes four inputs and outputs a one(1) when any two of the inputs are both ones(1) or zeros (0). (10 marks)
- b) Discuss common logic hazards. (4 marks)

- c) Discuss any two applications of transistors (6 marks)

QUESTION THREE (20 MARKS)

- a) Discuss operation of RS Latch using circuit diagrams, state diagrams and characteristic tables (10 marks)
- b) Realize an XOR gate using AND and OR gates (5 marks)
- c) Using a graph explain the charging and discharging of a capacitor (5 marks)

QUESTION FOUR (20 MARKS)

- a) Using circuit diagram, explain the operation of a D flip-flop (5 marks)
- b) Explain the following:
- i Shift-register (5 marks)
 - ii Synchronous transfer (5 marks)
- c) Given $S = AB' + A'B$ and $C = AB$. Implement this using a Half Adder. (5 marks)

QUESTION FIVE (20 MARKS)

- a) A student is taking a project on traffic light. In his display he would like to use a seven segment display. Using relevant diagrams explain how this would be achieved (10 marks)
- b) Explain the application of the following (6 marks)
- i Latches
 - ii Logic gates
 - iii Flip flops
- c) Describe finite state machines (4 marks)