

UNIVERSITY OF SWAZILAND
FACULTY OF SCIENCE
DEPARTMENT OF ELECTRONIC ENGINEERING

2006
MAIN EXAMINATION
-Practical-

Title of the Paper: **ELECTRONICS II**
Course Number: **E440, PAPER 2**
Time Allowed: **Three Hours.**

Instructions:

1. The total points for each section are shown on the left hand side of the page.
2. The lab manual is allowed to consult.
3. This paper has 3 pages, including this page.

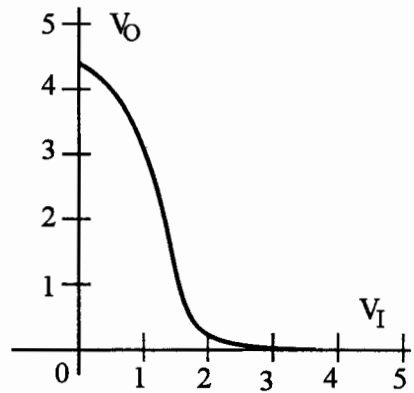
Special Requirement:

One floppy disc (labeled with your I.D. and name),
must be handed in, together with your answer sheet,
at the end of the examination

DO NOT OPEN THE PAPER
UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR.

Part I Practical Knowledge

- Q1 10pts.** Mark out the safety margins of V_{OH} and V_{OL} in the following graph.
- Q2 10pts.** On what occasion do you have to use an open-collector gate? Give two practical examples, together with their circuits of load.
- Q3 10pts.** Give the name of each segment of a 7-seg display; draw the figure. Why an LED display always needs a resistor in series with it.
- Q4 10pts.** For a universal register, describe the names and the functions of all its control pins.



Part II

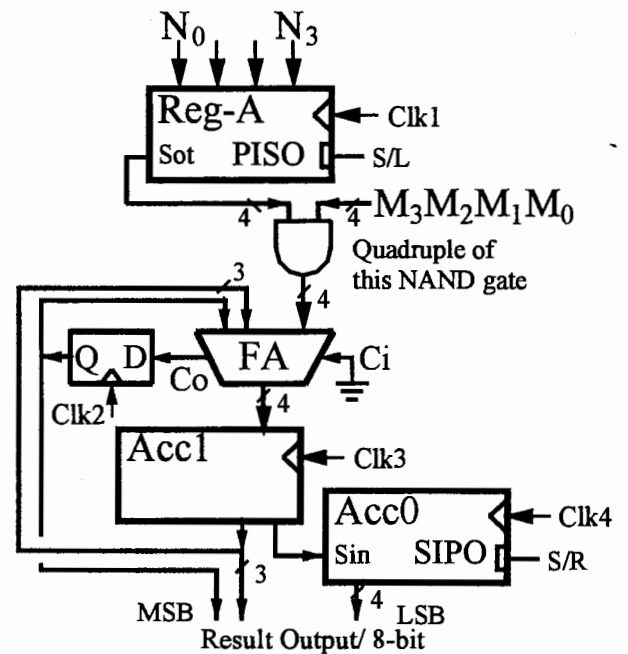
An Add-and-Shift Multiplier

System Description:

The figure shown below is a 4-bit by 4-bit, positive integer, and add-and-shift multiplier. The multiplicand is $M_3M_2M_1M_0$, hardware wired, and the multiplier is $N_3N_2N_1N_0$, stored in a PISO register A. The result is in two 4-bit registers, Acc1 and Acc0, where Acc1 for most significant 4 bits and Acc0, SIPO, for least significant 4 bits. A D-ff is for the last carry out. A 4-bit adder is used to do the summation and shift is provided by the registers themselves.

The control circuit is not shown in the circuit diagram. The student must work out the control circuit for himself. Register control pins, address selections, and enables are all in the control part. Timing must also be considered during simulation. Every pin of any IC must be properly treated or connected.

Students are asked to implement the circuit on the simulation software and test the result. The circuit below is for reference only; students may work out his own circuit. The key point is a multiplier under add-and-shift method. All parts are in the software library.



Marking Details:

- Q1 10pts. Selection of proper components. Give specific parts code.
- Q2 20pts. Correct circuit wiring and neat wiring style.
- Q3 10pts. Proper setting of test points.
- Q4 10pts. Proper remarks, symbol name, and test procedure.
- Q4 10pts. Correct Control circuit.

Suggested the numbers used in the test: $M=1100$, $N=0101$.