

EASTERN UNIVERSITY, SRILANKA

DEPARTMENT OF MATHEMATICS

FIRST YEAR EXAMINATION IN SCIENCE –2010/2011

SECOND SEMESTER (June, 2013)

CS106 - COMPUTER ORGANIZATION AND ARCHITECTURE

Answer all questions

Time allowed: 02 hours

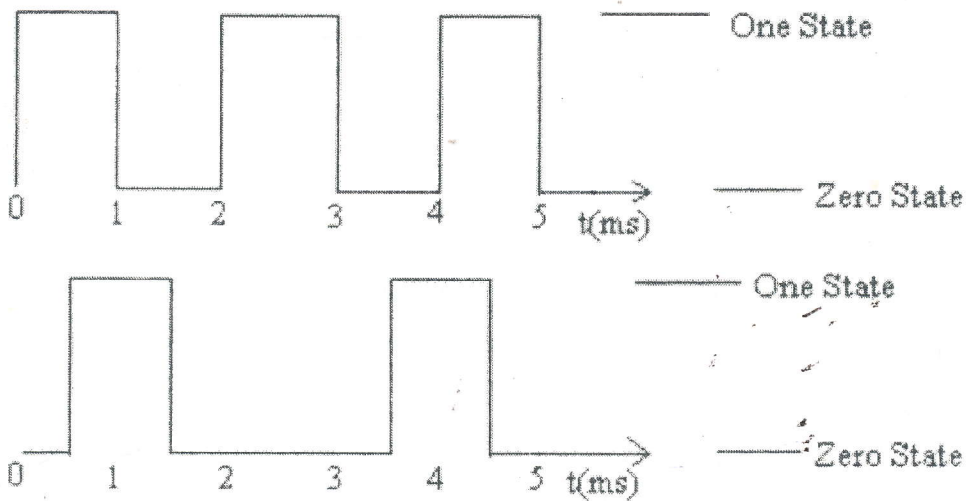
01.

- a) Briefly explain the following terms:
 - i. Arithmetic Logic Unit (ALU);
 - ii. Computer Architecture.
- b) Compare and contrast about the second and third generations of computers.
- c) What are the four main functions of a computer and draw the functional view diagram of a computer.
- d) Convert the decimal number 82.67 to its binary, octal and hexadecimal equivalent.
- e) Perform the following operations using the 2's complements:
 - i. $20 - 15$;
 - ii. $(-48) - (23)$;
 - iii. $(10011)_2 - (10010)_2$;
 - iv. $(100010)_2 - (100110)_2$.

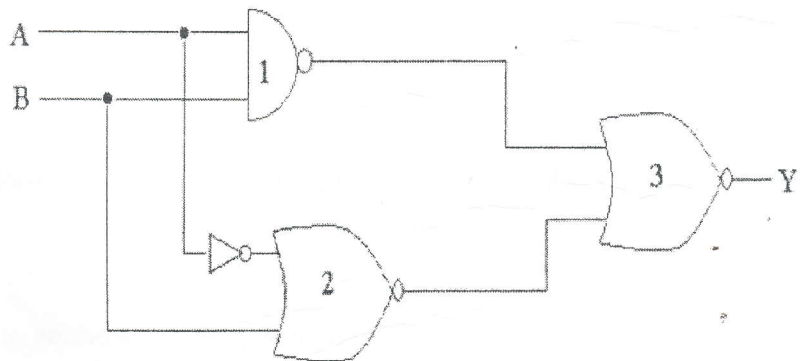
02.

- a) Verify that the following operations are commutative but not associative.
 - i. NAND
 - ii. NOR
- b) With relevant logic diagram and truth table explain the working of a two input X-OR gate.
- c) State and prove the **De Morgan's** laws.

- d) What is meant by universal gate? Explain briefly, how any one of the universal gates could function as basic gates.
- e) Construct a logic circuit using any one of the universal gates for the following expression: $X=A.(B.C)$.
- f) The voltage waveforms shown in figure below are applied at the inputs of 2-input AND and OR gates. Determine the output waveforms.



- g) Find the Boolean expression for the logic circuit shown below:





03.

- a) Briefly describe the following with an aid of suitable example:
 - i. Sum of Product (SOP);
 - ii. Product of Sum (POS).
- b) Distinguish between minterms and maxterms.
- c) A staircase light is controlled by the two switches. One at the top of the stairs and another at the bottom of stairs.
 - i. Make the truth table for this system.
 - ii. Write the logic equation in SOP form.
 - iii. Realize the circuit using AND and OR gates.
- d) Write the expression for Boolean function $F(A, B, C) = \sum m(1,4,5,6,7)$ in standard POS form.
- e) Minimize the following logic function using Karnaugh map and realize using NAND and NOR gates: $F(A, B, C, D) = \sum m(1,2,3,5,8,9,11,13,15)$.

04.

- a) With the help of a truth table explain the working of a half subtractor. Draw the logic diagram using gates.
- b) Draw the logic diagram of a full subtractor using half subtractors and explain its working with the help of a truth table.
- c) What is a multiplexer (MUX)? Illustrate its functional diagram. Write the scheme of a 4-input multiplexer using basic gates (AND/OR/NOT) and explain its operation.
- d) Design a 8 to 1 Multiplexer by using the three variable function given by

$$F(A, B, C) = \sum m(1,3,5,6).$$

- e) What is meant by a "Flip Flop"? Explain the R-S Flip Flop circuit using NOR gates.
- f) Distinguish between ROM, PROM, EPROM and EEPROM.