EASTERN UNIVERSITY, SRI LANKA
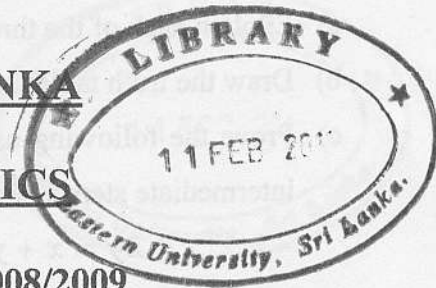
DEPARTMENT OF MATHEMATICS

FIRST EXAMINATION IN SCIENCE –2008/2009

SECOND SEMESTER (Sept. /Nov. 2010)

CS 106 – COMPUTER ORGANIZATION AND ARCHITECTURE

(PROPER & REPEAT)

Answer all questions   **Time allowed: 02 hours**

01.

a) Define the following terms:

   i.   computer architecture;

   ii.   computer organization.

b) What are the four main functions of a computer and draw the functional view diagram of a computer

c) Convert each of the following decimal values to 8-bit signed magnitude binary:

   i. 54_{10};

   ii. -49_{10};

   iii. -127_{10};

   iv. -66_{10}.

d) Convert each of the following 8-bit signed magnitude binary numbers to decimal numbers:

   i. 10011101_2;

   ii. 00010101_2;

   iii. 11100110_2;

e) What decimal value is represented by the following 32-bit floating point number?

1 10000000 11110110000000000000000

02.

a) Explain each of the three formats by which a Boolean function is usually expressed.

b) Draw the truth table and switch representation diagram of the NAND function.

c) Prove the following using the Boolean algebra. State any rules/theorems used at the intermediate steps to arrive at your answer.

    i. $x + \bar{x}y = x + y$

    ii. $x + (y.z) = (x + y).(x + z)$

    iii. $xy + \bar{x}z + yz = xy + \bar{x}z$

d) The circuit in below figure accepts four inputs a, b ,c ,d and has one output g
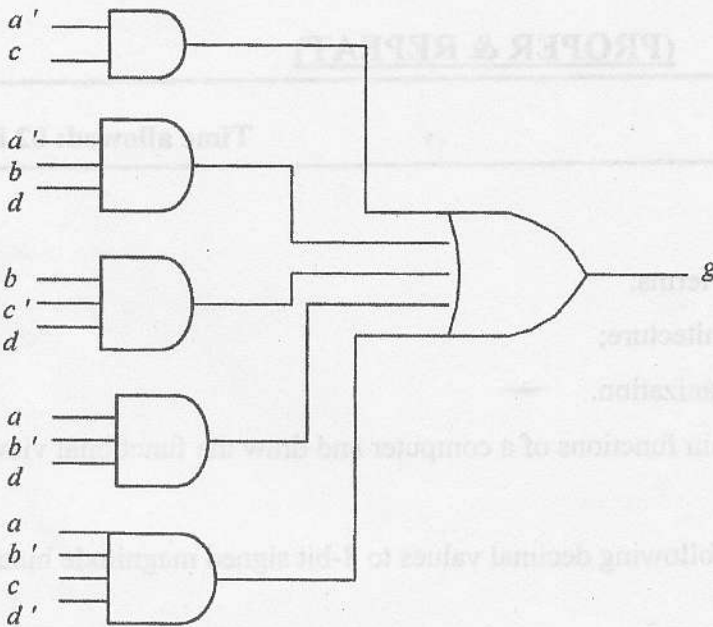
    i.   Express the function g(a, b, c, d) in sum of product form

    ii.   Simplify the function using Karnaugh map.

    iii. Find and draw a minimum equivalent logic circuit.

e) Obtain the truth table of the following functions and express each function in sum of minterm and product of maxterm.

    i. $(\bar{A} + B)(\bar{B} + C)$

    ii. $y'z + wxy' + wxz' + w'x'z$

03.

a) Briefly explain the following:
   i.   half adder;
   ii. full adder;
   iii. flip flop.

b) Draw the S-R Flip Flop circuit using NAND gates.

c) What do you understand by the eight channels multiplexer?

d) Design the digital logic for segment "*e*", using seven segment display driver truth table.

04.

a) What do you understand by the term pipelining in computer architecture?

b) A computer is designed to support pipelined architecture. An instruction is processed in 6 stages. Find the execution time for a program having 5 instructions.(assume that each stage of an instruction processing consumes 1 time unit)

c) Explain the memory hierarchy giving its characteristics.

d) What are the advantages of having cache memory in a computer?

e) Explain the basic instruction cycle with the aid of diagrams.