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EASTERN UNIVERSITY, SRILANKA

DEPARTMENT FO MATHEMATICS

EXTERNAL DEGREE EXAMINATION IN SCIENCE –2008/2009

FIRST YEAR SECOND SEMESTER (Feb, /Apr, 2011)

EXTCS – 106 COMPUTER ORGANIZATION AND ARCHITECTURE

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

01

a) Briefly explain the following terms:

i. Arithmetic Logic Unit (ALU);

ii. Registers;

iii. Control Unit.

b) Briefly explain the Von Newman machine architecture.

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

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

i. 48_{10};

ii. -29_{10};

iii. -18_{10}

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

i. 11001100_2;

ii. 00110011_2;

iii. 11110000_2

02.

a) Draw the truth table and switch representation diagram of the NOR function.

b) Prove the DeMorgan's Theorem using the truth table.

c) Apply the DeMorgan's Theorem to each of the following expressions:

i. $\overline{A.C + B}$;

ii. $\overline{D(C + B)(A + B)}$;

iii. $\overline{A + \bar{B} + C + (\overline{AB})}$.

d) Find the complement of the following Boolean functions:

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

ii. $A\bar{B} + \bar{C}\bar{D}$.

e) Simplify the following Boolean functions to a minimum number of literals. State any rules/theorems used at the intermediate steps to arrive at your answer.

i. $AB + \bar{A}C + BC$;

ii. $BC + A\bar{C} + AB + BCD$;

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

03.

a) What do you mean by "Karnaugh Map"?

b) List the seven rules of Karnaugh Map simplification.

c) Minimize the following problems using the Karnaugh maps method:

i. $Z = \bar{A}\bar{B}\bar{C} + \bar{A}B + AB\bar{C} + AC$;

ii. $Z = \bar{A}B + B\bar{C} + BC + A\bar{B}\bar{C}$;

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iii.

AB \ CD	00	01	11	10
00	1	0	0	1
01	0	0	0	0
11	0	0	1	1
10	1	1	1	1

d) Draw the truth table and logic circuit diagram for the following:

i. Half Adder;

ii. Full Adder.

04.

a) Define the following terms:

i. Minterms;

ii. Maxterms;

iii. Canonical and standard form.

b) Express the following function in a Sum of Minterms and Product of Maxterms

(AB+C) (B+AC)

c) What do mean by "Flip Flop"? Explain the R-S Flip Flop circuit using **NOR** gates.

d) List the characteristics of Memory System.

e) 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).