



EASTERN UNIVERSITY, SRILANKA

DEPARTMENT OF MATHEMATICS

FIRST YEAR EXAMINATION IN SCIENCE –2009/2010

SECOND SEMESTER (Apr /May, 2012)

CS – 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. Computer Architecture;
 - 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 a computer
- d) Convert the octal number 8561 to Binary.
- e) Determine the binary numbers represented by the following decimal numbers:
 - i. 125.25;
 - ii. 10.625;
 - iii. 0.6875.

02.

- a) Define the followings:
 - i. 1's complement
 - ii. 2's complement
- b) Compute $10_{10} - 17_{10}$ using 2's complement.
- c) Draw the truth table and switch representation diagram of the OR function.
- d) Prove the **DeMorgan's** Theorem using the truth table.

c) Prove the following identities using Boolean algebra:

- i. $(A + B)(A + \overline{AB})C + \overline{A}(B + \overline{C}) + \overline{A}B + ABC = C(A + B) + \overline{A}(B + \overline{C})$;
- ii. $\overline{\overline{A(A \cdot B)} \cdot \overline{B(A \cdot B)}} = A \oplus B$;
- iii. $\overline{\overline{AB} + \overline{A} + AB} = 0$.

03.

- a) Evaluate $x = \overline{A} \cdot B + C(\overline{A \cdot D})$ using the convention A = True and B = False.
- b) Simplify the Boolean expression $F = C(B + C)(A + B + C)$.
- c) Simplify and draw the logic diagram for the given expression

$$F = \overline{ABC} + \overline{A}BC + \overline{A}B\overline{C} + A\overline{B}\overline{C} + ABC$$

- d) Simplify the given expression to its Sum of Products (SOP) form. Draw the logic circuit for the simplified SOP function $Y = (A + B)(A + \overline{AB})C + \overline{A}(B + \overline{C})\overline{A}B + ABC$.
- e) Simplify the following expressions using Boolean postulates:

- i. $\overline{\overline{XY} + XYZ + X(Y + X\overline{Y})}$;
- ii. $Y = (\overline{A} + B)(A + C)(B + C)$;
- iii. $XY + \overline{XZ} + X\overline{Y}Z(XY + Z)$.

04.

- a) What do you mean by "Karnaugh Map".
- b) List the seven rules of "Karnaugh Map" simplification.
- c) Simplify the following expression into sum of products using Karnaugh map $F(A, B, C, D) = \sum(1, 3, 4, 5, 6, 7, 9, 12, 13)$ and Draw logic circuit for the simplified function.
- d) What is a half-adder? Explain a half-adder with the help of truth-table and logic diagram.
- e) What is meant by "Flip Flop"? Explain the R-S Flip Flop circuit using NOR gates.
- f) List the characteristics of Memory System.