Biyani Institute of Science & Management

I Internal Examination Sep. 2019
Class: MCA-I
Subject- Comupter Architecture (MCA-104A)

MM: 20 Set: A Time: 1½Hrs

[I] Answer the following questions in one line only (2 × 1=2)

Q.1 What is Boolean algebra?

Ans. Boolean algebra is a division of mathematics which deals with operations on logical values and incorporates binary variables. Boolean algebra traces its origins to an 1854 book by mathematician George Boole. The distinguishing factor of Boolean algebra is that it deals only with the study of binary variables.

Q.2 What is Latch?

Ans. Latch is an electronic logic circuit with two stable states i.e. it is a bistable multivibrator. Latch has a feedback path to retain the information. ... In case of Active – Low latch circuits, normally both the inputs are high. The circuit is triggered by a momentary low on either of the inputs.

[II]Answer the following questions in 50 words (2 × 3=6)

Q.1 Explain Duality Theorem?

Ans. The principle of duality in Boolean algebra states that if you have a true Boolean statement (equation) then the dual of this statement (equation) is true. The dual of a boolean statement is found by replacing the statement's symbols with their counterparts. This means a "0" becomes a "1", "1" becomes a "0", "+" becomes a "." and "." becomes a "+".

Here's an example of the principle of duality in Boolean algebra:

Suppose we have the following true Boolean statement (equation):

(*) 1 + 0 = 1

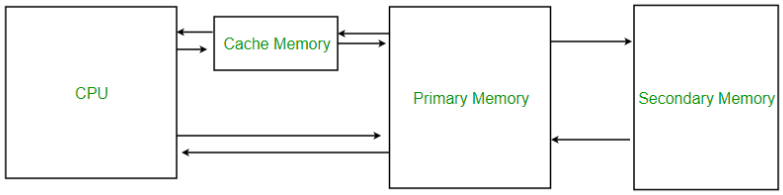
The dual of this statement is:

(**) 0 . 1 = 0

Q.2 Explain Cache Memory?

Ans. Cache Memory is a special very high-speed memory. It is used to speed up and synchronizing with high-speed CPU. Cache memory is costlier than main memory or disk memory but economical than CPU registers. Cache memory is an extremely fast memory type that acts as a buffer between RAM and the CPU. It holds frequently requested data and instructions so that they are immediately available to the CPU when needed.

Cache memory is used to reduce the average time to access data from the Main memory. The cache is a smaller and faster memory which stores copies of the data from frequently used main memory locations. There are various different independent caches in a CPU, which stored instruction and data.



[III]Answer the following questions in 150 words. (2 × 6=12)

Q.1 Explain K Map With Examples.

A Karnaugh map (K-map) is a pictorial method used to minimize Boolean expressions without having to use Boolean algebra theorems and equation manipulations. A K-map can be thought of as a special version of a truth table .

Using a K-map, expressions with two to four variables are easily minimized. Expressions with five to six variables are more difficult but achievable, and expressions with seven or more variables are extremely difficult (if not impossible) to minimize using a K-map.

A Karnaugh map provides a pictorial method of grouping together expressions with common factors and therefore eliminating unwanted variables. The Karnaugh map can also be described as a special arrangement of a truth table.

The diagram below illustrates the correspondence between the Karnaugh map and the truth table for the general case of a two variable problem.

A	B	F
0	0	a
0	1	b
1	0	c
1	1	d

Truth Table.

A / B	0	1
0	a	b
1	c	d

F.

The values inside the squares are copied from the output column of the truth table, therefore there is one square in the map for every row in the truth table. Around the edge of the Karnaugh map are the values of the two input variable. A is along the top and B is down the left hand side. The diagram below explains this:

A	B	F
0	0	0
0	1	1
1	0	1
1	1	1

Truth Table.

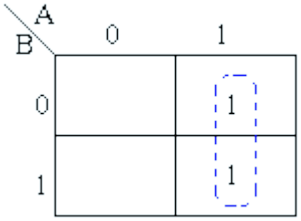
A / B	0	1
0	0	1
1	1	1

F.

The values around the edge of the map can be thought of as coordinates. So as an example, the square on the top right hand corner of the map in the above diagram has coordinates A=1 and B=0. This square corresponds to the row in the truth table where A=1 and B=0 and F=1. Note that the value in the F column represents a particular function to which the Karnaugh map corresponds.

Example 1:

Consider the following map. The function plotted is: Z = f(A,B) = A $\overline{B}$ + AB



Note that values of the input variables form the rows and columns. That is the logic values of the variables A and B (with one denoting true form and zero denoting false form) form the head of the rows and columns respectively.

Bear in mind that the above map is a one dimensional type which can be used to simplify an expression in two variables.

There is a two-dimensional map that can be used for up to four variables, and a three-dimensional map for up to six variables.

Using algebraic simplification,

Z = A $\overline{B}$ + AB

Z = A($\overline{B}$ + B)

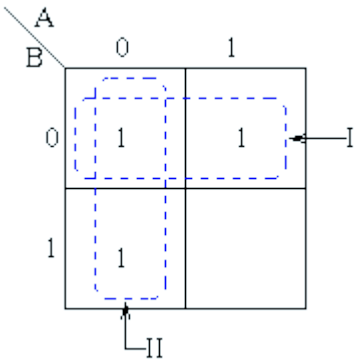
Z = A

Variable B becomes redundant due to Boolean Theorem T9a.

Referring to the map above, the two adjacent 1's are grouped together. Through inspection it can be seen that variable B has its true and false form within the group. This eliminates variable B leaving only variable A which only has its true form. The minimised answer therefore is Z = A.

Example 2:

Consider the expression Z = f(A,B) = $\overline{A}\,\overline{B}$ + A $\overline{B}$ + $\overline{A}$B plotted on the Karnaugh map:



Pairs of 1's are grouped as shown above, and the simplified answer is obtained by using the following steps:

Note that two groups can be formed for the example given above, bearing in mind that the largest rectangular clusters that can be made consist of two 1s. Notice that a 1 can belong to more than one group.

The first group labelled I, consists of two 1s which correspond to A = 0, B = 0 and A = 1, B = 0. Put in

another way, all squares in this example that correspond to the area of the map where B = 0 contains 1s, independent of the value of A. So when B = 0 the output is 1. The expression of the output will contain the term $\overline{B}$

For group labelled II corresponds to the area of the map where A = 0. The group can therefore be defined as $\overline{A}$. This implies that when A = 0 the output is 1. The output is therefore 1 whenever B = 0 and A = 0

Hence the simplified answer is Z = $\overline{A} + \overline{B}$

Q.2 Explain Applications of S-Ram.

Ans. SRAM (static RAM) is random access memory (RAM) that retains data bits in its memory as long as power is being supplied. Unlike dynamic RAM (DRAM), which stores bits in cells consisting of a capacitor and a transistor, SRAM does not have to be periodically refreshed. Static RAM provides faster access to data and is more expensive than DRAM. SRAM is used for a computer's cache memory and as part of the random access memory digital-to-analog converter on a video card.

Advantages:

- Simplicity – a refresh circuit is not needed
- Performance
- Reliability
- Low idle power consumption

Disadvantages:

- Price
- Density
- High operational power consumption

Embedded use

Many categories of industrial and scientific subsystems, automotive electronics, and similar, contain static RAM. Some amount (kilobytes or less) is also embedded in practically all modern appliances, toys, etc. that implement an electronic user interface. Several megabytes may be used in complex products such as digital cameras, cell phones, synthesizers, etc.

SRAM in its dual-ported form is sometimes used for real-time digital signal processing circuits.

In computers

SRAM is also used in personal computers, workstations, routers and peripheral equipment: CPU register files, internal CPU caches and external burst mode SRAM caches, hard disk buffers, router buffers, etc. LCD screens and printers also normally employ static RAM to hold the image displayed (or to be printed). Static RAM was used for the main memory of some early personal computers such as the ZX80, TRS-80 Model 100 and Commodore VIC-20.

Hobbyists

Hobbyists, specifically home-built processor enthusiasts,[4] often prefer SRAM due to the ease of interfacing. It is much easier to work with than DRAM as there are no refresh cycles and the address and data buses are directly accessible rather than multiplexed. In addition to buses and power connections, SRAM usually requires only three controls: Chip Enable (CE), Write Enable (WE) and Output Enable (OE). In synchronous SRAM, Clock (CLK) is also included.