**DATA REPRESENTATION (III)**

’’Systems can be divided into two main classifications: digital systems and analogue systems. A digital system only understands 0s and 1s (binary information), whereas an analogue system can take on many values.

Imagine that you are an army scout whose job is to sit on a hill and watch for an attacking army. You have been given two flags: a red flag and a green flag, which are inserted into a single flagpole. You could now represent two different conditions or states. The green flag could represent that there were no armies approaching, and the red flag could represent that there was an army advancing on the city. Thus:

* red flag- approaching army;
* green flag- no approaching army.

Now, this does not give much information on the size of the army, at all, or if the approaching army is an aggressive one or a friendly one. Thus, if we used two flags we could represent four different conditions or states:

* red flag, red flag- approaching large aggressive army. Get troops ready for battle.
* red flag, green flag- approaching small aggressive army. Put troops on standby.
* green flag, red flag- approaching friendly army. Set up green parade.
* green flag, green flag- no approaching army.

It can be seen that we have to decide which of the flags is more significant than the other; as we need to differentiate between a Green, Red and a red, Green condition. Thus, we could signify that the flag on the left-hand side is more significant than the flag on the right-hand side, as this flag represents that there is an aggressive army approaching. This flag would be seen as the most-significant flag. Now, let us represent the flags with either R (for red), and G (for green). Thus, the states now become:

* RR – approaching large aggressive army. Get troops ready for battle.
* RG – approaching small aggressive army. Put troops on standby.
* GR – approaching friendly army. Set up green parade.
* GG - no approaching army.

The number of flags that we have thus determines the number of conditions that we can represent. If we only have one colour of flag, then we can only represent two states with one flag, four states with two flags, eight states with three flags and so on. This type of representation with two conditions for each representation is known as binary. In computer systems the conditions for each representation is a ’’0’’ and a ’’1’’ (or, sometimes, TRUE or FALSE). Thus, in binary, we could represent the red flag with a ’’1’’ and the green flag with a ’’0’’. Our condition or states are now: 00 (no approaching army); 01 (approaching friendly army); 10 (approaching small aggressive army); and 11 (approaching large aggressive army).

A particular problem that we might have when we are signalling the information about the army is when our flags are changing. For example, say that we are currently in the condition of GG, and a large aggressive army started to approach. The scout would then have to change the flags from GG to RR. This will take two changes before he can reflect the new condition. How would he do it? If he changed the most-significant flag first, he would signal that there was an approaching friendly army, and the city would get a greeting parade ready, only then to be told that there was a large aggressive army approaching. This would obviously confuse anyone in the city. If he changed the least-significant flag, then the troops would be put on standby, only to be told that they would immediately be put on full alert. The problem we have is that we need some way to change the state of the flags, so that intermediate values are not taken as final values. Thus, the only way to do this would be to hide the changeover of the flags. This also occurs in a computer system where values of the binary digits change, and these should not be taken as valid values. This is overcome with clock signals and handshaking lines, which are used to define when the values on the computer’s bus are actually valid, or not.’’

**EXERCISES**

**Choose from the following words to complete the text below. Pay attention that some forms of the words must be changed:**

*account, ordering, boiled, mixed, trivial, allegory, least, intent, problem, anarchy, referred, edict, based, rare, Plea, lowest, bugs, big, versus, interconnected, highest, programming, paper*

The representation of data types is always a 1)… , as different computer systems use different ways to store and represent data. For example, the PC, which is 2)… on the Intel microprocessors, uses the little endian approach of representing a floating-point value. The little endian form starts with the 3)… -significant byte in the lowest memory location, and the most-significant byte in the 4)… location. The big endian form, as used with Motorola-based systems, always starts with the high-order byte and ends with the 5)… -order byte.

In computing, endianness is the 6)… of individually addressable sub-units (words, bytes, or even bits) within a longer data word stored in external memory. The most typical cases are the ordering of bytes within a 16-, 32-, or 64- bit word, where endianness is often simply 7)… to as byte order. The usual contrast is between most 8)… least significant byte first, called big-endian and little-endian respectively 9)... forms are also possible; the ordering of bytes within a 16-bit word may be different from the ordering of 16-bit words within a 32-bit word, for instance; although 10)…, such cases are sometimes collectively referred to as mixed-endian or middle-endian.

Endianness may be seen as a low-level attribute of a particular representation format. Byte order is an important consideration in network 11)… , since two computers with different byte orders may be communicating. Failure to 12)… for varying endianness when writing code for mixed platforms can lead to 13)… that can be difficult to detect.

The terms Little-Endians and Big-Endians were introduced in 1980 by Danny Cohen in his 14)… "On Holy Wars and a Plea for Peace". It uses Gulliver’s Travels by Jonathan Swift (1726) as an 15)… for the byte order (aka Endianness) issue which became crucial when computers became 16)… with each other by networks.

In 1726, Swift described tensions in Lilliput and Blefuscu: whereas royal 17) … in Lilliput requires cracking open one's soft- 18).....egg at the small end, inhabitants of the rival kingdom of Blefuscu crack theirs at the 19) .. end (giving them the moniker Big-endians). The terms little-endian and endianness have a similar 20)...

"On Holy Wars and a 21)… for Peace" by Danny Cohen ends with: "Swift's point is that the difference between breaking the egg at the little-end and breaking it at the big-end is 22)… Therefore, he suggests, that everyone does it in his own preferred way. We agree that the difference between sending eggs with the little- or the big-end first is trivial, but we insist that everyone must do it in the same way, to avoid 23)… Since the difference is trivial we may choose either way, but a decision must be made.

**Translate into English:**

**A.**

În China antică s-au folosit seturi complete de 8 trigrame şi 64 hexagrame, corespunzând cu numere cu câte 3 respectiv 6 cifre binare. Şi în Africa se pot menţiona diverse combinaţii binare antice.

În anul 1605 Francis Bacon şi-a imaginat un sistem de codificare a literelor alfabetului prin câte o secvenţă de cifre binare. El şi-a dat seama că, pentru codificare, se pot folosi nu numai cifrele binare, dar şi orice alte obiecte cu 2 stări, ca de exemplu clopote (bat sau nu bat), lumini, torţe ş.a.

Tot în sec. XVII matematicianul german Gottfried Leibniz a descris în articolul său Explication de l'Arithmétique Binaire sistemul binar în întregime, folosindu-se chiar de simbolurile moderne 0 şi 1.

În anul 1854 matematicianul şi filozoful englez George Boole a publicat o lucrare fundamentală care prezintă un sistem logic denumit mai târziu algebra Booleană. Acest sistem s-a dovedit esenţial pentru dezvoltarea sistemului binar şi implementarea sa în circuitele electronice de mai târziu.

În 1937, Claude Shannon, un inginer şi matematician american, a pus bazele teoriei informaţiei precum şi cele ale proiectării circuitelor electronice digitalepractic la toate calculatoarele moderne.

**B.  
1. PLACA DE BAZĂ**

Aceasta reprezintă cea mai importantă componentă aflată în carcasă; mai este denumită şi placa principală (motherboard). Pe ea se află aplicate următoarele componente: micropocesorul, memoria, alte plăci necesare funcţionării unor echipamente inserate în locaşe speciale, numite SLOT-uri. Printre alte plăci există: placa video, placa de sunet, modemul, placa de reţea, etc. Pe lângă acestea, porturile seriale şi paralele servesc la conectarea unor dispozitive periferice, cum ar fi : mouse – ul, imprimanta, modem – ul . Placa de baza pastreaza legatura si cu celelalte componente ale calculatorului care nu sunt amplasate direct pe ea, prin magistrale (cum ar fi CD-ROM, HDD, FLOPPY DISK).