

Task:

A bus is a set of wires connecting computer components. A computer may have several buses, e.g. a system bus, an internal bus, and special purpose local buses. All communication between the various components takes place over one of these buses. For example, data transfer between the CPU and memory normally occurs on the system bus, while movement of data between registers and the ALU takes place on a bus internal to the microprocessor chip. The speed at which data can be transferred is dependent on the number of data lines in the bus and, in the case of synchronous buses, the clock speed of the bus. The transfer rate or bandwidth of a particular system bus can be calculated from the number of cycles required for transfer, the length of the cycle and the number of data lines. Each data line carries 1 bit at a time.

Suppose that a bus has 16 data lines and requires 4 cycles of 250 ns each to transfer data. The bandwidth of this bus would be,
 a) 1Mb/s b) 2 Mb/s c) 4 Mb/s d) 8Mb/s

Solution:

We calculate the time required for one-time data transfer via bus with 16 data lines:

$$T = 250ns \cdot 4 = 1000ns = 1mks = 10^{-6}s$$

Calculate the amount of information transmitted at a time:

$$D = 16 \cdot 1bit = 16bit = 2b$$

Calculate the bandwidth of this bus by the following formula:

$$V = \frac{D}{T}$$

Where V – bandwidth, D – amount of data transmitted at a time, T – time of required for one-time data transfer via bus.

$$V = \frac{2b}{10^{-6}s} = 2 * 10^6 \frac{b}{s} = 2 \frac{Mb}{s}$$

Answer: b) 2 Mb/s