

A stylized graphic of a circuit board, rendered in light blue lines. It features a central vertical bus with various branches extending to the left and right, ending in small circles representing components or connection points. The lines are thin and the overall style is minimalist and technical.

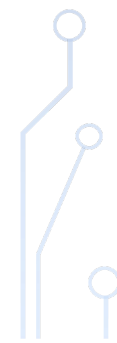


RAČUNARSKI HARDVER

MIKROPROCESORI. VJEŽBE

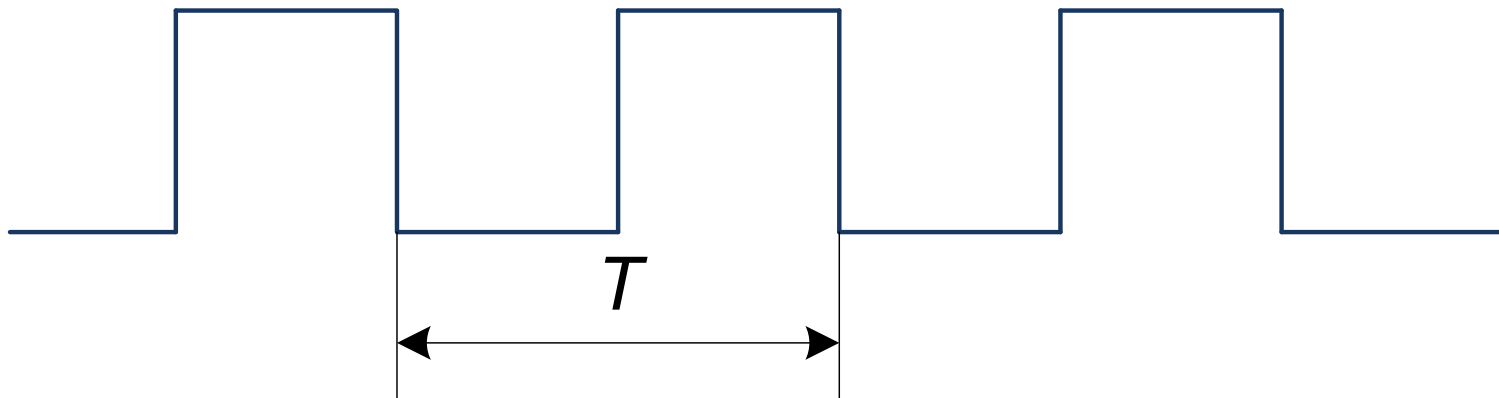


ZADATAK 1

Ako je frekvencija takt impulsa kojim se taktuje mikroprocesor $f = 2 \text{ GHz}$, koliko iznosi njegova perioda T ?



ZADATAK 1



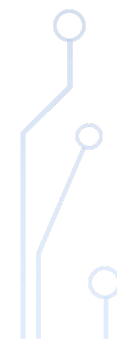


$$T = \frac{1}{f} = \frac{1}{2 \text{ GHz}} = \frac{1}{2 \cdot 10^9 \text{ Hz}} = 0.5 \text{ ns}$$



ZADATAK 1

Pitanje: Koliko taktova generiše oscilator za dvije sekunde?

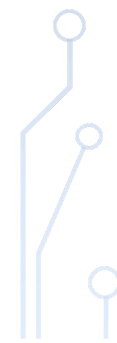


Odgovor: 4 000 000 000



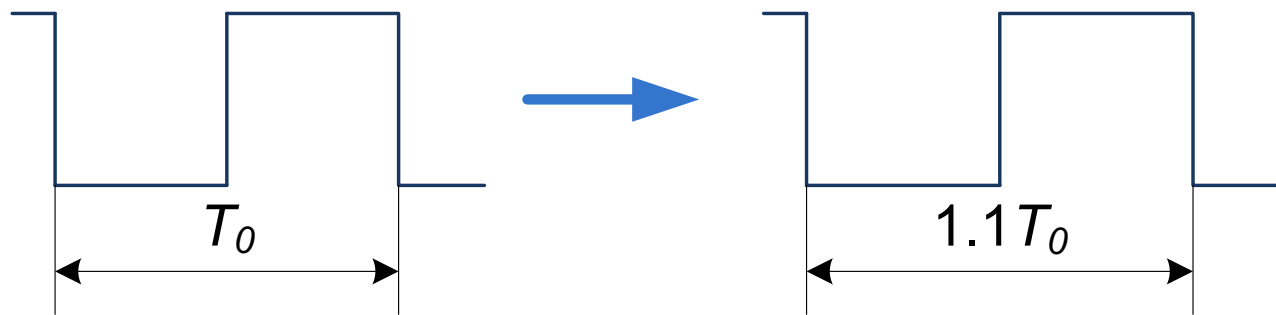


ZADATAK 2

Ako se perioda T_0 takt impulsa kojim se taktuje mikroprocesor poveća za 10 %, za koliko će se smanjiti njegova frekvencija f_0 ?



ZADATAK 2



$$f_0 = \frac{1}{T_0}$$

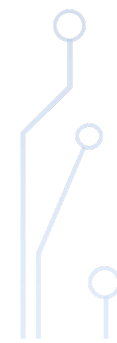


$$f_1 = \frac{1}{T_1} = \frac{1}{1.1 T_0} = \frac{f_0}{1.1} \Rightarrow f_1 = 0.9091 f_0$$

$$\Delta f = f_0 - f_1 = 0.0909 f_0$$

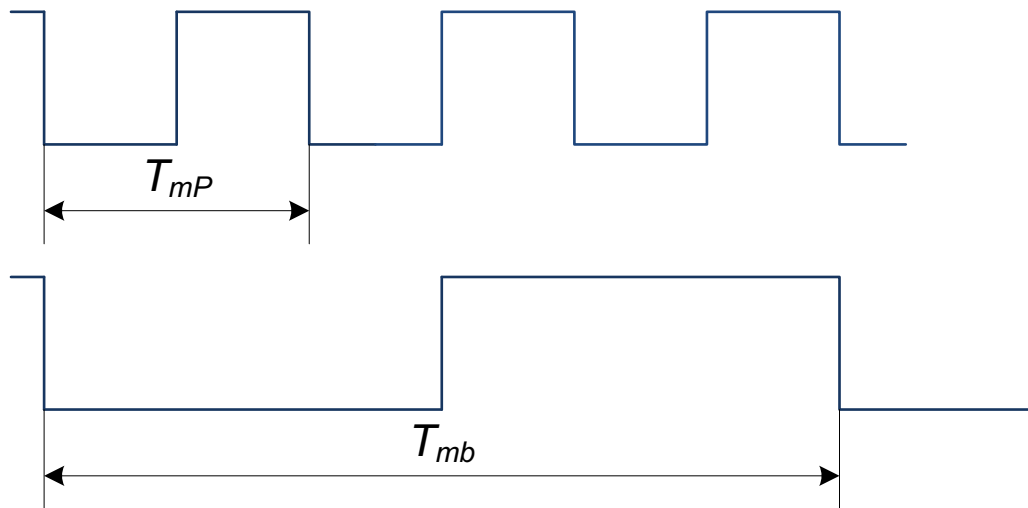


ZADATAK 3

Ako je frekvencija takt impulsa kojim se taktuje mikroprocesor $f_{mP} = 2.4$ GHz, a frekvencija takt impulsa kojim se taktuje čip-set na matičnoj ploči $f_{mb} = 800$ MHz, koliki je umnožak m brzine matične ploče?



ZADATAK 3

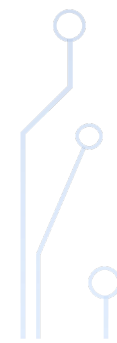




$$m = \frac{f_{mP}}{f_{mb}} = \frac{2.4 \text{ GHz}}{800 \text{ MHz}} = 3$$



ZADATAK 4

Ako se napon napajanja mikroprocesora V_{DD} smanji za 20 %, koliko puta treba povećati frekvenciju takt impulsa mikroprocesora f da bi disipacija snage P ostala ista?





ZADATAK 4

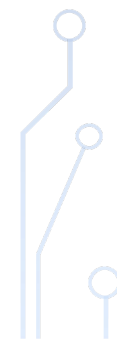


$$V_{DD2} = 0.8 V_{DD1}$$

$$P_1 = k f_1 V_{DD1}^2, P_2 = k f_2 V_{DD2}^2$$

$$P_1 = P_2$$

$$k f_1 V_{DD1}^2 = k f_2 V_{DD2}^2$$

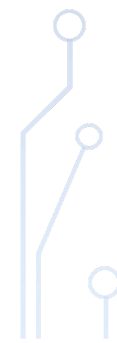


$$f_1 V_{DD1}^2 = f_2 (0.8 V_{DD1})^2$$

$$f_1 = f_2 (0.8)^2 \Rightarrow f_2 = 1.5625 f_1$$




ZADATAK 5

Na koji način je moguće smanjiti disipaciju snage P mikroprocesora za 10 % ukoliko se zahtjeva da brzina obrade podataka ostane nepromijenjena?
Napon napajanja iznosi $V_{DD} = 1.35 \text{ V}$ i može se mijenjati u granicama $1.25 \text{ V} < V_{DD} < 1.5 \text{ V}$.

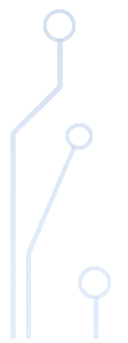




ZADATAK 5

$$P = kfV_{DD}^2$$

$$f = \text{const.}, P \searrow \implies V_{DD} \searrow$$





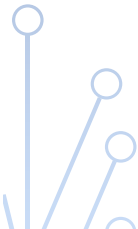




ZADATAK 5



$$P_2 = 0.9 P_1$$


$$f_1 = f_2 \Rightarrow \frac{P_1}{kV_{DD1}^2} = \frac{P_2}{kV_{DD2}^2}$$

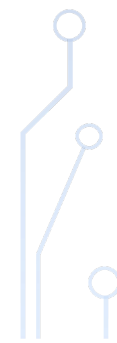



$$\frac{P_1}{kV_{DD1}^2} = \frac{0.9P_1}{kV_{DD2}^2}$$


$$\frac{V_{DD2}^2}{V_{DD1}^2} = 0.9 \Rightarrow V_{DD2} = \sqrt{0.9}V_{DD1} = 1.28 V$$




ZADATAK 6

Ako VID logika sadrži 3 bita, a kombinacija bita 000 rezervisana je za operaciju isključenja napona napajanja mikroprocesora, napraviti tabelarni prikaz zavisnosti napona napajanja mikroprocesora V_{DD} od VID logike ako se napon napajanja V_{DD} može mijenjati u opsegu od 1.2 V do 1.5 V.



ZADATAK 6

$b_2 b_1 b_0$	V_{DD} [V]
0 0 0	0
0 0 1	1.2
0 1 0	1.25
0 1 1	1.3
1 0 0	1.35
1 0 1	1.4
1 1 0	1.45
1 1 1	1.5

$$\Delta V_{DD} = \frac{1.5 \text{ V} - 1.2 \text{ V}}{6} = 0.05 \text{ V}$$