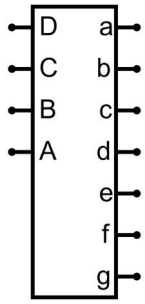
Varianta: 50 Příjmení: Novan Třída: 2.D Zadáno: 22.4.2024 Odevzdáno: 6.5.2024

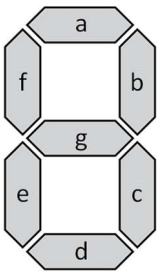
Číslicová technika - návrh kombinačního obvodu (1)
Dekodér pro 7-mi segmentový displej

Navrhněte dekodér pro sedmi-segmentový displej, který kóduje hodnoty 0, 1, 2, 3, 4, 5 z přímého dvojkového kódu na hodnoty 5, 0, 1, 4, 8, 6 zobrazované na sedmi-segmentovém displeji. Pro ostatní vstupní hodnoty jsou postupně rozsvěcovány segmenty a, b, g, e, d, c, g, f, a. Při poslední hodnotě displej zhasne. Realizujte pomocí NAND logiky.

Zdroj: https://en.wikipedia.org/wiki/Seven-segment_display

1) Blokové schéma obvodu



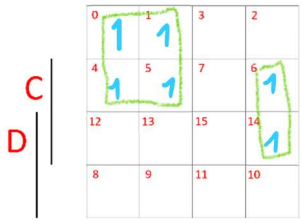


2) Popis chování obvodu

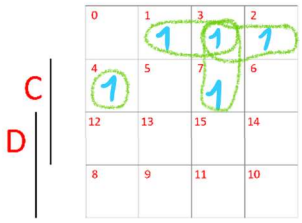
Vstup					Výstup							
X_D	D	C	B	A	a	b	c	d	e	f	g	Y_{DIS}
0	0	0	0	0	1	0	1	1	0	1	1	5
1	0	0	0	1	1	1	1	1	1	1	0	0
2	0	0	1	0	0	1	1	0	0	0	0	1
3	0	0	1	1	0	1	1	0	0	1	1	4
4	0	1	0	0	1	1	1	1	1	1	1	8
5	0	1	0	1	1	0	1	1	1	1	1	6
6	0	1	1	0	1							a
7	0	1	1	1		1						b
8	1	0	0	0							1	g
9	1	0	0	1					1			e
10	1	0	1	0				1				d
11	1	0	1	1			1					c
12	1	1	0	0							1	g
13	1	1	0	1						1		f
14	1	1	1	0	1							a
15	1	1	1	1								

3) Logická funkce obvodu

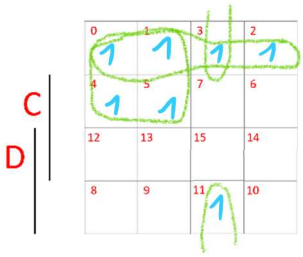
?a



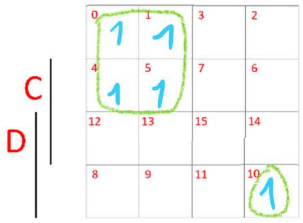
?b



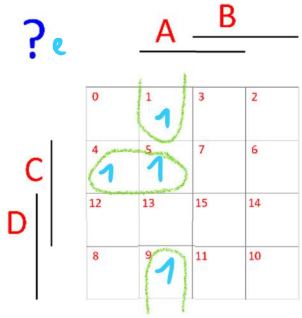
?c



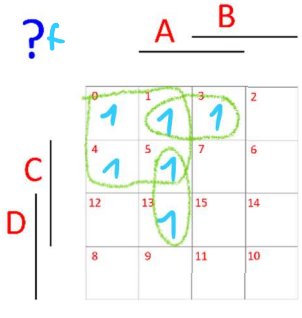
?d



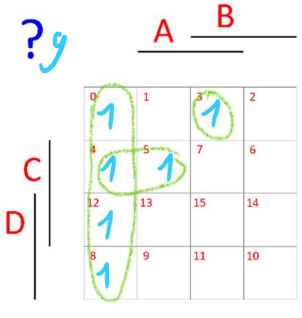
?e



?f



?g



Varianta: 50 Příjmení: Novan Třída: 2.D Zadáno: 22.4.2024 Odevzdáno: 6.5.2024

4) Minimalizace logické funkce

$a(D,C,B,A) = \overline{D}\overline{B} + CB\overline{A}$

$b(D,C,B,A) = \overline{D}\overline{C}A + \overline{D}BA + \overline{D}\overline{C}B + \overline{D}C\overline{B}\overline{A}$

$c(D,C,B,A) = \overline{D}\overline{C} + \overline{D}\overline{B} + \overline{C}BA$

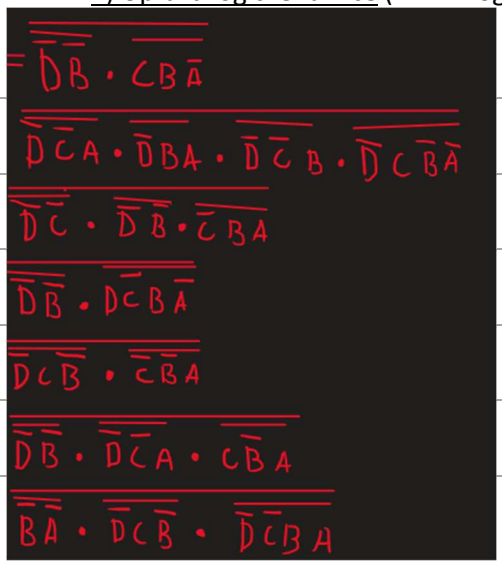
$d(D,C,B,A) = \overline{D}\overline{B} + DC\overline{B}\overline{A}$

$e(D,C,B,A) = \overline{D}C\overline{B} + \overline{C}B\overline{A}$

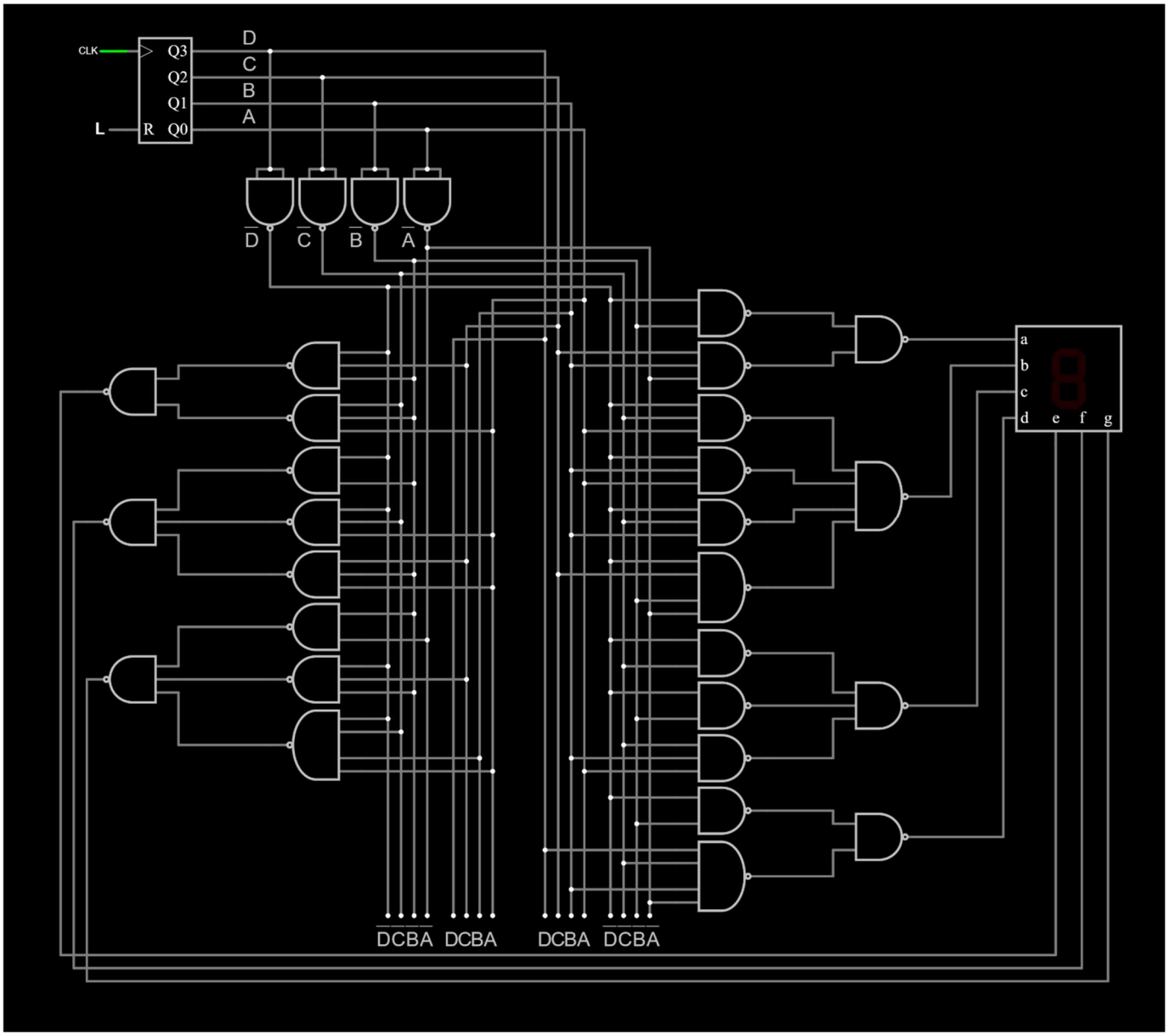
$f(D,C,B,A) = \overline{D}\overline{B} + \overline{D}\overline{C}A + \overline{C}B\overline{A}$

$g(D,C,B,A) = \overline{B}\overline{A} + \overline{D}C\overline{B} + \overline{D}\overline{C}BA$

4) Úprava logické funkce (NAND logika)



5) Zapojení logické sítě obvodu



6) Validace pomocí simulátoru:

https://tinyurl.com/2yqyz7qp

https://www.falstad.com/circuit/circuitjs.html?ctz=CQAgjCAMB0l3BWEAmaYAcBmMkFgCwYBsyk6+RICkVVNCApgLRhgBQYeI+cUVYyPjUH02Ad36Ci+KgE4pMyOMl8E8ocrUi5gsJSWclWkJkEB2SDNN9tCDgjMh0va7IEntjmkokWrg5xprAy4mUnQQWUomUxoom1V7CDCybnwImNI0iKDEwxAUiOQEaNiUEr5MRIkYhHNyJ2kQMwafRpk9GnQmlsVlGMxKQKd44bb0Ud4Jyk6oZXkI2YWnPTmJZfRVzK7VpQAPArBMGkyM1irMpBlkGQARDiaws0FtgpuTsppFIT4AMwBDAA2AGcGHMAEpvZ4FMqvV4QXS8VBIZFCaB2A5EJBMTYrAotECUG4gACCSW4vCaeAUlUSB3QjjMZiqOCqTMoRJkZlOFmazMafI5KBkACE2Ac6nyqkRZILCcKQABhcUmGRMqpcdny4n3A56JDq8C4rXXLkqgiyw36uWmkBivWYNn8zg0E0K5V6sCM52YNVmSi23UoIhOqrIMyW-3cBX24XesM9KO2j0obBS4URN06lXhyNh2QGpMK7kmVjp0yZqOckBB0x51WULXVlO++MmENy6uxwZ+qqYZyd4vKZDoM4zKMsfTD6E0WbeYcVVYEDpTiTvDzgEcbto8E6rWG7ZS78CUTCSw8SY-pcoBnJHynXaFNHdTIJECIDkLJeIsCc-+LCHkoTWL+pQvABKBARAIFeqe4H6JBoj5D+sGRNEEG2P0rAvKhTAoVGbQ4nuf7RKhhHXqBMI4QRWGkROME0RIWyoQxq7cGcUasWsTjEZQ+FsdhhxRvx3F4XR6GkeohFcZkhxScoXEwfJ6ziWhckiPM0QDv+bEDkwTQgc+CkvAZ8HcY8FEgde0kvJZZk7hkIE-sE-TOWZYncT+A6DBkn7KHpBmSvpfQSBZESOtE1lHo5giwi5NS4bCbnzglE7FHBbwVIRuEjjFbyjnMBwsMcbwoUcpVVMmKrFScyCPKwMhhEQEC2rGNVvDBBBvMgsq2mSNQoeoHmvDZ6lUfld4SEpsUvOlnmSYIP7IMShHJcKHxZKNYQFXN22TRuYQVOGs1ZZp3XXAVYQrWdV2NTl116gUuJeviERdtVHY4skFCvdqMgpiw4ZPckrAnAS1b3AAMlCs3EjEljnT8AIgmCSBfhSs5btSm45CYUEY+A6jY2AUl40hXDHnN2Nzbk5MtS4gwqBFfDfHY+TGMtaoI5zLPVDohIyMYUUSMTWPqAI+3GBL-MkxpIvuLLVD4B0ylKyrggIMrKCpG0mvXKkHM65o7hU1rNOaGbFR6+t3HW+uHM8NxfgoMSzJEtdviMzzbsC07jNNMMRny7FjPGMzuvqMzHOnZevCCWUgkvpj4WM9LSfgGbBXLtxx4sVkZH3rO6jHYTcsE+EKA7UbsfCI7ZTrunc3M+bNcoNCJcl+nxz+EECNd1kTebYXJiSmesWSl377tuFU-p-g1jM-PZdXi4WTHujV6rNjhAIZhrf4PEY-cABw8UD33BGfkV4Dtvn6lVQw8lMIBVPznvB29C1vp3UKeUD-cxX3flrbGX8yYP3ZuodIroEZQNpKIYO3At6QlvPzHeqCg4qFgULPyCDrbGC-poImwDIEnwkMMeI-olikOaFPChU9YFtGdrAyh7F5yAJoEQA27hOG40wuwwkL9uEFS+PjYw0hoEyHEQkeBKgeH8zkRHKQBt1AkBCrIl+KjhGEKkBoqQM5tGEk-iomOPFk6mIFilZoCMpGB0dm0dcrx1zxRvBNFxKCS6HSJDObiuVEa+MnNxHyT03wfksUE7yU8gltCPsFEeug2JH33KPCeClknj0EAfBJjMmDXmZmnBSqctzNxMcU08jMl6BPKQvUOW5olZFkgeBJ9T9z53cHU2c7gE6MQ8LOTiA87HGVrkELI3dAkjIRmUdegyCaTIwf41Yvjs72KzpnIo1dK5rKKC-ThPjvElzmU+R8uhVYl0Vh3fRa525XI1lrexi4iQVGFi468g9LHHjDlkYw6dVFxMJB7X5mTfk-PaRfc+Xzh5Yk5BwkxTjBDrkhW-Dh0JmZEAuSYGpv9DHL14M7Euzt7GfzNtCfFw9nghOaEPKakTqWZkpdPCl5KfbRMlD8o+TKCkcmRYzdlU1PmRyyDyjZVAdm+MFXi7mxLGZ3LgsICoYrHYIvXOy-IS4tweTTmAtmXBViPHiM+TVyhVjXmNftOy7FzVtB1R0LWGDs5LhtWo1YA5nWWICjIF13ElzcI6G05QYVfaJ0NTMLcA58lkK6BGnGnqZha1Qksw1E4lxRnjQNDkjUK4YMKL7LNOC3ipEElmsNebFhqviPklVMwhpltJnw7VDyJIuNpuAutPSCiH02gapi45bzgG6Sa81Bdw1RoHBXS1RJUgjvWQsx2LyBmXkWEmIoc6TwuKaC3AN3rG1BrbroKMncE0xo6HutF+4EbZ1GZah1GcrB923WUbydLJ2hNbWO9F3a32euPbuspbEs27XiOuv90Is2fH6BXJKMrRlVwcRXRWhFYNVsrRpCtJgGgeX7N8WtEAjUUXiMrXGVQ6Yrv-h5f+IiZHobQ+B1oYHUgYeLdwZxWb8NtoDE85jjwK5kdoxEEj8RuM1EmXZHYv764VAGPW0SpSYSMzGP0MozlJTUNqItUokpejRvpRE-aRreB4d4G0LycQAwGf8sMyNUTt0VONc42dXwlgVNfSx7OLHL03utTIVzVmA5fAwdpnioLNOAuNdQmzGSHPUK3pu7GbQ10VCpL6rtasTz0FuUG7wKXkuvtfqhV+lrOKpyjHlg9wremNilel5LsxBUuevNnGrRTdBbkFfp4zzQKtDrPgFwVCWaSCpCz29lQA

falstad.com