Lucrarea de laborator nr. 3

Minimizarea funcţiilor logice şi elaborarea schemei electrice principiale

Scopul lucrării:

1. Obţinerea deprinderilor de minimizare a funcţiilor logice.
2. Obţinerea deprinderilor de construire a schemelor electrice principiale.

Experimentul nr. 1. Proiectarea schemei electrice numerice principiale

1.1. De completat tabelul de adevăr şi de minimizat (prin metoda Karnough) funcţiile logice prezentate în următorul tabel (studentul alege varianta funcţiei logice conform numărului de ordine din registrul grupei academice).

Nr. d/o	Funcţia logică
1.	f(a,b,c,d,e,f) = ∑(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 32, 33, 34, 35, 36, 37, 38, 41, 42, 43, 44, 53, 54, 55, 56, 57, 58, 59, 60, 61)
2.	f(a,b,c,d,e,f) = ∑(1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 33, 34, 35, 36, 37, 38, 42, 43, 44, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62)
3.	f(a,b,c,d,e,f) = ∑(3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 42, 43, 44, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63)
4.	f(a,b,c,d,e,f) = ∑(5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 42, 43, 44, 45, 46, 47,53, 54, 55, 56, 57, 58, 59, 60, 61, 62)
5.	f(a,b,c,d,e,f) = ∑(2, 5, 6, 7, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 42, 43, 44, 45, 46, 47,53, 54, 55, 56, 57, 58, 59, 60)
6.	f(a,b,c,d,e,f) = ∑(1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 42, 43, 44, 45, 46, 47,53, 54, 55, 56, 57, 60)
7.	f(a,b,c,d,e,f) = ∑(5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 42, 43, 44, 45, 46, 47,53, 54, 55, 56, 57)
8.	f(a,b,c,d,e,f) = ∑(3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 42, 43, 44, 45, 46, 47,53, 54, 55, 62, 63)
9.	f(a,b,c,d,e,f) = ∑(7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 42, 43, 44, 45, 46, 47,53, 54, 55, 62, 63)
10.	f(a,b,c,d,e,f) = ∑(5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25,

	26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 52, 54, 55, 62)
11.	f(a,b,c,d,e,f) = ∑(1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 52, 54)
12.	f(a,b,c,d,e,f) = ∑(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 42, 43, 44, 45, 46, 47, 48, 49, 50, 55, 56, 57, 59)
13.	f(a,b,c,d,e,f) = ∑(3, 4, 5, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 52, 53, 54)
14.	f(a,b,c,d,e,f) = ∑(2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 60)
15.	f(a,b,c,d,e,f) = ∑(0, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49)
16.	f(a,b,c,d,e,f)=∑(7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31, 32,33, 34, 35, 36, 37, 38, 39, 42, 43, 44, 45, 46, 47, 53, 54, 55, 56, 62, 63)
17.	f(a,b,c,d,e,f) = ∑(7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54)
18.	f(a,b,c,d,e,f) = ∑(8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55)
19.	f(a,b,c,d,e,f) = ∑(11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57)
20.	f(a,b,c,d,e,f) = ∑(12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59)
21.	f(a,b,c,d,e,f) = ∑(14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61)
22.	f(a,b,c,d,e,f) = ∑(0, 1, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62)
23.	f(a,b,c,d,e,f) = ∑(0, 1, 2, 3, 4, 5, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61)
24.	f(a,b,c,d,e,f) = ∑(1, 2, 3, 4, 5, 6, 7, 8, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60)
25.	f(a,b,c,d,e,f) = ∑(4, 5, 6, 7, 8, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62)

1.2. Construiţi schema electrică principială conform funcţiei logice minimizate.

1.3. Comparaţi numărul de elemente logice necesare pentru elaborarea schemei electrice pînă la minimizare şi după minimizare.
1.4. Controlaţi funcţionalitatea schemei electrice principiale cu ajutorul dispozitivului LOGIC CONVERTER.

Experimentul nr. 2. Elaborarea schemei electrice logice din elemente ŞI-NU

2.1. Transformaţi funcţia logică minimizată (obţinută în experimentul nr. 1), utilizînd teorema de Morgan, în funcţie care conţine numai operaţii logice ŞI-NU.
2.2. Construiţi schema electrică a funcţiei logice obţinută în punctul 2.1.
2.3. Controlaţi funcţionalitatea schemei electrice principiale cu ajutorul dispozitivului LOGIC CONVERTER.

Experimentul nr. 3. Elaborarea schemei electrice logice din elemente SAU-NU

3.1. Transformaţi funcţia logică minimizată (obţinută în experimentul nr. 1), utilizînd teorema de Morgan, în funcţie care conţine numai operaţii logice SAU-NU..
3.2. Construiţi schema electrică a funcţiei logice obţinută în punctul 3.1.
3.3. Controlaţi funcţionalitatea schemei electrice principiale cu ajutorul dispozitivului LOGIC CONVERTER

Lucrarea de laborator se finalizează cu un raport, ce va conţine:

1. Numărul şi denumirea lucrării de laborator.
2. Numele, pronumele studentului, codul grupei academice,
3. Denumirea experimentelor.
4. Fiecare experiment va conţine schemele electrice construite şi tabelele de adevăr cu datele primite în urma măsurătorilor.
5. Concluzii referitor la rezultatele obţinute.

Întrebări de control

La prezentarea raportului trebuie să fiţi capabili să răspundeţi la următoarele întrebări de control:

1. Definiţi noţiunea de formă complet normală dizjunctivă (conjuctivă) a funcţiei logice.
2. Definiţi noţiunea de mintermen (maxtermen).

3. Numiţi metodele de minimizare a funcţiilor logice.
4. Ce proprietăţi au tabelele Karnough?
5. Care sînt etapele minimizării funcţiei logice prin metoda Karnough?
6. Ce avantaje are dispozitivul numeric, construit conform funcţiilor logice minimizate, în comparaţie cu dispozitivul numeric, construit conform funcţiilor logice neminimizate.