КАЗАНСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

Задачи по дискретной математике для контрольных и самостоятельных работ

О.-д. функции. Теория кодирования. Графы

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Практикум предназначен для студентов, изучающих курс "Дискретная математика", а также для преподавателей, ведущих практические занятия по данному курсу.

1. Построить диаграмму Мура для о.д.-функции $\varphi(x(1)x(2)\dots x(t)\dots) = y(1)y(1)\dots y(t)\dots$, где

1.1. $y(t) = \begin{cases} 0, & t = 1 \\ x(t-1) \sim x(t), & t \geq 2 \end{cases}$

1.2. $y(t) = \begin{cases} 1, & t = 1 \\ x(t-1) \oplus x(t), & t \geq 2 \end{cases}$

1.3. $y(t) = \begin{cases} 0, & t = 1 \\ x(t-1)x(t), & t \geq 2 \end{cases}$

1.4. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \to x(t-1), & t \geq 2 \end{cases}$

1.5. $y(t) = \begin{cases} 1, & t = 1 \\ x(t) \mid x(t-1), & t \geq 2 \end{cases}$

1.6. $y(t) = \begin{cases} 0, & t = 1 \\ x(t-1) \vee x(t), & t \geq 2 \end{cases}$

1.7. $y(t) = \begin{cases} 0, & t = 1 \\ x(t-1) \to x(t), & t \geq 2 \end{cases}$

1.8. $y(t) = \begin{cases} 1, & t = 1 \\ x(t-1) \downarrow x(t), & t \geq 2 \end{cases}$

1.9. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t-1)} \to x(t), & t \geq 2 \end{cases}$

1.10. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{x(t-1) \vee x(t)}, & t \geq 2 \end{cases}$

1.11. $y(t) = \begin{cases} 1, & t = 1 \\ x(t-1) \oplus \overline{x(t)}, & t \geq 2 \end{cases}$

1.12. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t-1)} \sim x(t), & t \geq 2 \end{cases}$

1.13. $y(t) = \begin{cases} 1, & t = 1 \\ x(t-1) \to \overline{x(t)}, & t \geq 2 \end{cases}$

1.14. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{x(t)} \sim \overline{x(t-1)}, & t \geq 2 \end{cases}$

1.15. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t)x(t-1)}, & t \geq 2 \end{cases}$

1.16. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{x(t-1) \to x(t)}, & t \geq 2 \end{cases}$

1.17. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{x(t)} \oplus \overline{x(t-1)}, & t \geq 2 \end{cases}$

1.18. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t-1) \downarrow x(t)}, & t \geq 2 \end{cases}$

1.19. $y(t) = \begin{cases} 0, & t = 1 \\ x(t-1)\overline{x(t)}, & t \geq 2 \end{cases}$

1.20. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{x(t-1)} \vee x(t), & t \geq 2 \end{cases}$

1.21. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \oplus \overline{x(t-1)}, & t \geq 2 \end{cases}$

1.22. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \mid \overline{x(t-1)}, & t \geq 2 \end{cases}$

1.23. $y(t) = \begin{cases} 1, & t = 1 \\ x(t-1) \vee \overline{x(t)}, & t \geq 2 \end{cases}$

1.24. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t) \mid x(t-1)}, & t \geq 2 \end{cases}$

1.25. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t)} \mid x(t-1), & t \geq 2 \end{cases}$

1.26. $y(t) = \begin{cases} 1, & t = 1 \\ x(t-1)\overline{x(t)}, & t \geq 2 \end{cases}$

1.27. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \downarrow \overline{x(t-1)}, & t \geq 2 \end{cases}$

1.28. $y(t) = \begin{cases} 0, & t = 1 \\ x(t-1) \sim \overline{x(t)}, & t \geq 2 \end{cases}$

1.29. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t-1)} \oplus x(t), & t \geq 2 \end{cases}$

1.30. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{x(t-1)} \to x(t), & t \geq 2 \end{cases}$

2. Построить систему канонических уравнений для о.д.-функции $\varphi(x(1)x(2)\dots x(t)\dots) = y(1)y(1)\dots y(t)\dots$, где

2.1. $y(t) = \begin{cases} 0, & t = 1 \\ y(t-1) \sim x(t), & t \geq 2 \end{cases}$

2.2. $y(t) = \begin{cases} 1, & t = 1 \\ y(t-1) \oplus x(t), & t \geq 2 \end{cases}$

2.3. $y(t) = \begin{cases} 1, & t = 1 \\ y(t-1)x(t), & t \geq 2 \end{cases}$

2.4. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \to y(t-1), & t \geq 2 \end{cases}$

2.5. $y(t) = \begin{cases} 1, & t = 1 \\ x(t) \mid y(t-1), & t \geq 2 \end{cases}$

2.6. $y(t) = \begin{cases} 0, & t = 1 \\ y(t-1) \vee x(t), & t \geq 2 \end{cases}$

2.7. $y(t) = \begin{cases} 0, & t = 1 \\ y(t-1) \to x(t), & t \geq 2 \end{cases}$

2.8. $y(t) = \begin{cases} 1, & t = 1 \\ y(t-1) \downarrow x(t), & t \geq 2 \end{cases}$

2.9. $y(t) = \begin{cases} \overline{0}, & t = 1 \\ \overline{y(t-1)} \to x(t), & t \geq 2 \end{cases}$

2.10. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{y(t-1) \vee x(t)}, & t \geq 2 \end{cases}$

2.11. $y(t) = \begin{cases} 1, & t = 1 \\ y(t-1) \oplus \overline{x(t)}, & t \geq 2 \end{cases}$

2.12. $y(t) = \begin{cases} \overline{0}, & t = 1 \\ \overline{y(t-1)} \sim x(t), & t \geq 2 \end{cases}$

2.13. $y(t) = \begin{cases} 1, & t = 1 \\ y(t-1) \to \overline{x(t)}, & t \geq 2 \end{cases}$

2.14. $y(t) = \begin{cases} \overline{1}, & t = 1 \\ \overline{x(t)} \sim \overline{y(t-1)}, & t \geq 2 \end{cases}$

2.15. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t)y(t-1)}, & t \geq 2 \end{cases}$

2.16. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{y(t-1) \to x(t)}, & t \geq 2 \end{cases}$

2.17. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{x(t)} \oplus \overline{y(t-1)}, & t \geq 2 \end{cases}$

2.18. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{y(t-1) \downarrow x(t)}, & t \geq 2 \end{cases}$

2.19. $y(t) = \begin{cases} 1, & t = 1 \\ y(t-1)\overline{x(t)}, & t \geq 2 \end{cases}$

2.20. $y(t) = \begin{cases} 1, & t = 1 \\ \overline{y(t-1)} \vee x(t), & t \geq 2 \end{cases}$

2.21. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \oplus \overline{y(t-1)}, & t \geq 2 \end{cases}$

2.22. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \mid \overline{y(t-1)}, & t \geq 2 \end{cases}$

2.23. $y(t) = \begin{cases} 0, & t = 1 \\ y(t-1) \vee \overline{x(t)}, & t \geq 2 \end{cases}$

2.24. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t) \mid y(t-1)}, & t \geq 2 \end{cases}$

2.25. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{x(t)} \mid y(t-1), & t \geq 2 \end{cases}$

2.26. $y(t) = \begin{cases} 1, & t = 1 \\ y(t-1)\overline{x(t)}, & t \geq 2 \end{cases}$

2.27. $y(t) = \begin{cases} 0, & t = 1 \\ x(t) \downarrow \overline{y(t-1)}, & t \geq 2 \end{cases}$

2.28. $y(t) = \begin{cases} 0, & t = 1 \\ y(t-1) \sim \overline{x(t)}, & t \geq 2 \end{cases}$

2.29. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{y(t-1)} \oplus x(t), & t \geq 2 \end{cases}$

2.30. $y(t) = \begin{cases} 0, & t = 1 \\ \overline{y(t-1)} \to x(t), & t \geq 2 \end{cases}$

3. Построить диаграмму Мура для о.д.-функции $\varphi(x(1)x(2)\dots x(t)\dots) = y(1)y(1)\dots y(t)\dots$, где

3.1. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ \overline{x(t-1) \oplus x(t-2)}, & t \geq 3 \end{cases}$

3.2. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ x(t-1) \vee \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.3. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-1)} \sim x(t-2), & t \geq 3 \end{cases}$

3.4. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ x(t-1) \to \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.5. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ \overline{x(t-2)} \sim \overline{x(t-1)}, & t \geq 3 \end{cases}$

3.6. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-2)x(t-1)}, & t \geq 3 \end{cases}$

3.7. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ \overline{x(t-1) \to x(t-2)}, & t \geq 3 \end{cases}$

3.8. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ \overline{x(t-2)} \vee \overline{x(t-1)}, & t \geq 3 \end{cases}$

3.9. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-1) \mid x(t-2)}, & t \geq 3 \end{cases}$

3.10. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-1)\overline{x(t-2)}, & t \geq 3 \end{cases}$

3.11. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ \overline{x(t-1)} \to x(t-2), & t \geq 3 \end{cases}$

3.12. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-1) \mid \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.13. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ x(t-1) \mid x(t-2), & t \geq 3 \end{cases}$

3.14. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-1)} \to \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.15. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-2) \downarrow x(t-1)}, & t \geq 3 \end{cases}$

3.16. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-2)} \downarrow x(t-1), & t \geq 3 \end{cases}$

3.17. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ \overline{x(t-1)}\ \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.18. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-2) \downarrow \overline{x(t-1)}, & t \geq 3 \end{cases}$

3.19. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ x(t-1) \oplus \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.20. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-1) \sim x(t-2), & t \geq 3 \end{cases}$

3.21. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ x(t-1) \vee x(t-2), & t \geq 3 \end{cases}$

3.22. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-1)x(t-2), & t \geq 3 \end{cases}$

3.23. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-2) \to x(t-1), & t \geq 3 \end{cases}$

3.24. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ x(t-2) \downarrow x(t-1), & t \geq 3 \end{cases}$

3.25. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-1) \oplus x(t-2), & t \geq 3 \end{cases}$

3.26. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-1)} \downarrow \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.27. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-2) \mid \overline{x(t-1)}, & t \geq 3 \end{cases}$

3.28. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ x(t-1) \sim \overline{x(t-2)}, & t \geq 3 \end{cases}$

3.29. $y(t) = \begin{cases} 0, & t = 1 \\ 1, & t = 2 \\ \overline{x(t-1)} \vee x(t-2), & t \geq 3 \end{cases}$

3.30. $y(t) = \begin{cases} 1, & t = 1 \\ 0, & t = 2 \\ \overline{x(t-1)} \rightarrow x(t-2), & t \geq 3 \end{cases}$

4. Для о.д.-функции φ, заданной системой канонических уравнений, построить усеченное дерево.

4.1. $\varphi : \begin{cases} y(t) = x_1(t) \sim x_2(t) \sim q(t-1) \\ q(t) = x_1(t) \oplus x_2(t) \\ q(0) = 0 \end{cases}$

4.2. $\varphi : \begin{cases} y(t) = x_1(t) \vee x_2(t) \vee q(t-1) \\ q(t) = x_1(t) \oplus x_2(t) \\ q(0) = 1 \end{cases}$

4.3. $\varphi : \begin{cases} y(t) = x_1(t) \oplus x_2(t) \oplus q(t-1) \\ q(t) = x_1(t)x_2(t) \\ q(0) = 0 \end{cases}$

4.4. $\varphi : \begin{cases} y(t) = (x_1(t) \to x_2(t)) \to q(t-1) \\ q(t) = x_1(t) \oplus x_2(t) \\ q(0) = 0 \end{cases}$

4.5. $\varphi : \begin{cases} y(t) = x_1(t)x_2(t)q(t-1) \\ q(t) = x_1(t) \sim x_2(t) \\ q(0) = 1 \end{cases}$

4.6. $\varphi : \begin{cases} y(t) = x_1(t) \sim x_2(t) \sim q(t-1) \\ q(t) = x_1(t) \vee x_2(t) \\ q(0) = 0 \end{cases}$

4.7. $\varphi : \begin{cases} y(t) = x_1(t) \to (x_2(t) \to q(t-1)) \\ q(t) = x_1(t) \sim x_2(t) \\ q(0) = 0 \end{cases}$

4.8. $\varphi : \begin{cases} y(t) = x_1(t) \vee x_2(t) \vee q(t-1) \\ q(t) = x_1(t)x_2(t) \\ q(0) = 1 \end{cases}$

4.9. $\varphi : \begin{cases} y(t) = (x_1(t) \to x_2(t)) \to q(t-1) \\ q(t) = x_1(t)x_2(t) \\ q(0) = 0 \end{cases}$

4.10. $\varphi : \begin{cases} y(t) = x_1(t) \vee x_2(t) \vee q(t-1) \\ q(t) = x_1(t) \to x_2(t) \\ q(0) = 1 \end{cases}$

4.11. $\varphi : \begin{cases} y(t) = x_1(t)x_2(t) \to q(t-1) \\ q(t) = x_1(t) \oplus x_2(t) \\ q(0) = 1 \end{cases}$

4.12. $\varphi : \begin{cases} y(t) = (x_1(t) \to x_2(t)) \oplus q(t-1) \\ q(t) = x_1(t) \sim x_2(t) \\ q(0) = 0 \end{cases}$

4.13. $\varphi : \begin{cases} y(t) = (x_1(t) \oplus x_2(t)) \vee q(t-1) \\ q(t) = x_1(t) \to x_2(t) \\ q(0) = 1 \end{cases}$

4.14. $\varphi : \begin{cases} y(t) = x_1(t)(x_2(t) \sim q(t-1)) \\ q(t) = x_1(t) \vee x_2(t) \\ q(0) = 1 \end{cases}$

4.15. $\varphi : \begin{cases} y(t) = x_1(t) \to \overline{x_2(t)q(t-1)} \\ q(t) = x_1(t)x_2(t) \\ q(0) = 0 \end{cases}$

4.16. $\varphi : \begin{cases} y(t) = \overline{(x_1(t) \to x_2(t)) \downarrow q(t-1)} \\ q(t) = x_1(t) \to (x_2(t) \to x_1(t)) \\ q(0) = 1 \end{cases}$

4.17. $\varphi : \begin{cases} y(t) = x_1(t)\overline{x_2(t)} \oplus \overline{q(t-1)} \\ q(t) = x_1(t) \vee \overline{x_2(t)} \\ q(0) = 1 \end{cases}$

4.18. $\varphi : \begin{cases} y(t) = \overline{x_1(t) \downarrow x_2(t)} \oplus q(t-1)) \\ q(t) = x_1(t) \oplus x_2(t) \oplus 1 \\ q(0) = 0 \end{cases}$

4.19. $\varphi : \begin{cases} y(t) = (x_1(t) \vee \overline{x_2(t)})q(t-1) \\ q(t) = (x_1(t) \oplus x_2(t)) \vee x_2(t) \\ q(0) = 0 \end{cases}$

4.20. $\varphi : \begin{cases} y(t) = \overline{x_1(t)}\overline{(x_2(t) \vee \overline{q(t-1)})} \\ q(t) = x_1(t) \to x_2(t) \\ q(0) = 1 \end{cases}$

4.21. $\varphi : \begin{cases} y(t) = (x_1(t) \oplus \overline{x_2(t)})(x_2(t) \oplus \overline{q(t-1)}) \\ q(t) = x_1(t)x_2(t) \\ q(0) = 0 \end{cases}$

4.22. $\varphi : \begin{cases} y(t) = \overline{x_1(t) \downarrow (x_2(t) \mid \overline{q(t-1)})} \\ q(t) = x_1(t) \oplus x_2(t) \\ q(0) = 0 \end{cases}$

4.23. $\varphi : \begin{cases} y(t) = (x_1(t) \to x_2(t))(x_2(t) \to q(t-1)) \\ q(t) = x_1(t) \vee x_2(t) \\ q(0) = 1 \end{cases}$

4.24. $\varphi : \begin{cases} y(t) = x_1(t)\overline{(x_2(t) \mid q(t-1))} \\ q(t) = x_1(t)x_2(t) \\ q(0) = 0 \end{cases}$

4.25. $\varphi : \begin{cases} y(t) = (x_1(t) \oplus \overline{x_2(t)}) \mid q(t-1) \\ q(t) = x_1(t) \sim x_2(t) \\ q(0) = 0 \end{cases}$

4.26. $\varphi : \begin{cases} y(t) = x_1(t) \vee x_2(t) \vee q(t-1) \\ q(t) = x_1(t)\overline{x_2(t)} \\ q(0) = 1 \end{cases}$

4.27. $\varphi : \begin{cases} y(t) = (x_1(t) \vee x_2(t)) \downarrow q(t-1) \\ q(t) = x_1(t) \oplus x_2(t) \\ q(0) = 0 \end{cases}$

4.28. $\varphi : \begin{cases} y(t) = (x_1(t)x_2(t)) \mid q(t-1) \\ q(t) = x_1(t) \sim x_2(t) \\ q(0) = 0 \end{cases}$

4.29. $\varphi : \begin{cases} y(t) = x_1(t) \oplus (x_2(t) \to q(t-1)) \\ q(t) = x_1(t)(x_1(t) \vee x_2(t)) \\ q(0) = 0 \end{cases}$

4.30. $\varphi : \begin{cases} y(t) = \overline{x_1(t)} \oplus (x_2(t) \mid q(t-1)) \\ q(t) = \overline{x_1(t)} \to x_2(t) \\ q(0) = 1 \end{cases}$

5. Для о.д.-функции φ, заданной системой канонических уравнений, построить диаграмму Мура.

5.1. $\varphi: \begin{cases} y(t) = (x(t) \to q_1(t-1)) \sim q_2(t-1) \\ q_1(t) = \overline{x(t)} \oplus q_1(t-1) \\ q_2(t) = \overline{x(t)} \to q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.2. $\varphi: \begin{cases} y(t) = (x(t) \sim q_1(t-1)) \vee q_2(t-1) \\ q_1(t) = x(t) \to q_1(t-1) \\ q_2(t) = x(t)(x(t) \vee q_2(t-1)) \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.3. $\varphi: \begin{cases} y(t) = x(t)(q_1(t-1) \oplus q_2(t-1)) \\ q_1(t) = x(t) \vee q_1(t-1) \\ q_2(t) = x(t) \oplus q_2(t-1) \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.4. $\varphi: \begin{cases} y(t) = x(t) \to \overline{q_1(t-1)q_2(t-1)} \\ q_1(t) = x(t)q_1(t-1) \\ q_2(t) = x(t) \sim q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.5. $\varphi: \begin{cases} y(t) = \overline{(x(t) \to q_1(t-1)) \mid q_2(t-1)} \\ q_1(t) = x(t) \to (q_1(t-1) \to x(t)) \\ q_2(t) = x(t)\overline{q_2(t-1)} \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.6. $\varphi: \begin{cases} y(t) = x(t)\overline{q_1(t-1)} \sim \overline{q_2(t-1)} \\ q_1(t) = x(t) \vee \overline{q_1(t-1)} \\ q_2(t) = x(t) \oplus q_2(t-1) \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.7. $\varphi: \begin{cases} y(t) = \overline{x(t) \downarrow q_1(t-1)} \sim q_2(t-1)) \\ q_1(t) = x(t) \sim q_1(t-1) \\ q_2(t) = x(t) \mid q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.8. $\varphi: \begin{cases} y(t) = (x(t) \vee \overline{q_1(t-1)})q_2(t-1) \\ q_1(t) = (x(t) \sim q_1(t-1)) \vee q_1(t-1) \\ q_2(t) = x(t)q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.9. $\varphi:\begin{cases} y(t)=\overline{x(t)}\overline{(q_1(t-1)\vee\overline{q_2(t-1)})} \\ q_1(t)=x(t)\to q_1(t-1) \\ q_2(t)=x(t)\sim q_2(t-1) \\ q_1(0)=q_2(0)=1 \end{cases}$

5.10. $\varphi:\begin{cases} y(t)=(x(t)\sim\overline{q_1(t-1)})(q_1(t-1)\sim\overline{q_2(t-1)}) \\ q_1(t)=x(t)q_1(t-1) \\ q_2(t)=x(t)\sim q_2(t-1) \\ q_1(0)=q_2(0)=0 \end{cases}$

5.11. $\varphi:\begin{cases} y(t)=\overline{x(t)\downarrow(q_1(t-1)\mid\overline{q_2(t-1)})} \\ q_1(t)=x(t)\sim q_1(t-1) \\ q_2(t)=x(t)q_2(t-1) \\ q_1(0)=q_2(0)=0 \end{cases}$

5.12. $\varphi:\begin{cases} y(t)=(x(t)\to q_1(t-1))(q_1(t-1)\to q_2(t-1)) \\ q_1(t)=x(t)\vee q_1(t-1) \\ q_2(t)=x(t)\sim q_2(t-1) \\ q_1(0)=q_2(0)=1 \end{cases}$

5.13. $\varphi:\begin{cases} y(t)=x(t)q_1(t-1)q_2(t-1) \\ q_1(t)=x(t)\oplus q_1(t-1) \\ q_2(t)=x(t)\to q_2(t-1) \\ q_1(0)=q_2(0)=1 \end{cases}$

5.14. $\varphi:\begin{cases} y(t)=x(t)\oplus q_1(t-1)\oplus q_2(t-1) \\ q_1(t)=x(t)\vee q_1(t-1) \\ q_2(t)=x(t)q_2(t-1) \\ q_1(0)=q_2(0)=0 \end{cases}$

5.15. $\varphi:\begin{cases} y(t)=x(t)\to(q_1(t-1)\to q_2(t-1)) \\ q_1(t)=x(t)\oplus q_1(t-1) \\ q_2(t)=x(t)\downarrow q_2(t-1) \\ q_1(0)=q_2(0)=0 \end{cases}$

5.16. $\varphi:\begin{cases} y(t)=x(t)\vee q_1(t-1)\vee q_2(t-1) \\ q_1(t)=x(t)q_1(t-1) \\ q_2(t)=x(t)\vee q_2(t-1) \\ q_1(0)=q_2(0)=1 \end{cases}$

5.17. $\varphi:\begin{cases} y(t)=(x(t)\to q_1(t-1))\to q_2(t-1) \\ q_1(t)=x(t)q_1(t-1) \\ q_2(t)=x(t)\oplus q_2(t-1) \\ q_1(0)=q_2(0)=0 \end{cases}$

5.18. $\varphi : \begin{cases} y(t) = x(t) \vee q_1(t-1) \vee q_2(t-1) \\ q_1(t) = x(t) \to q_1(t-1) \\ q_2(t) = x(t) \vee q_2(t-1) \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.19. $\varphi : \begin{cases} y(t) = x(t)q_1(t-1) \to q_2(t-1) \\ q_1(t) = x(t) \sim q_1(t-1) \\ q_2(t) = x(t) \vee q_2(t-1) \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.20. $\varphi : \begin{cases} y(t) = x(t)\overline{(q_1(t-1) \mid q_2(t-1))} \\ q_1(t) = x(t) \to q_1(t-1) \\ q_2(t) = x(t)q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.21. $\varphi : \begin{cases} y(t) = x(t) \oplus q_1(t-1) \oplus q_2(t-1) \\ q_1(t) = x(t) \sim q_1(t-1) \\ q_2(t) = x(t) \to q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.22. $\varphi : \begin{cases} y(t) = x(t) \vee q_1(t-1) \vee q_2(t-1) \\ q_1(t) = x(t) \sim q_1(t-1) \\ q_2(t) = (x(t) \sim q_2(t-1)) \vee q_2(t-1) \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.23. $\varphi : \begin{cases} y(t) = x(t) \sim q_1(t-1) \sim q_2(t-1) \\ q_1(t) = x(t)q_1(t-1) \\ q_2(t) = x(t) \sim q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.24. $\varphi : \begin{cases} y(t) = (x(t) \to q_1(t-1)) \to q_2(t-1) \\ q_1(t) = x(t) \sim \overline{q_1(t-1)} \\ q_2(t) = x(t) \vee \overline{q_2(t-1)} \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.25. $\varphi : \begin{cases} y(t) = (x(t) \sim \overline{q_1(t-1)}) \mid q_2(t-1) \\ q_1(t) = x(t) \oplus q_1(t-1) \\ q_2(t) = x(t) \to (q_2(t-1) \to x(t)) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.26. $\varphi : \begin{cases} y(t) = x(t) \vee q_1(t-1) \vee q_2(t-1) \\ q_1(t) = x(t)\overline{q_1(t-1)} \\ q_2(t) = x(t) \oplus q_2(t-1) \\ q_1(0) = q_2(0) = 1 \end{cases}$

5.27. $\varphi : \begin{cases} y(t) = (x(t) \vee q_1(t-1)) \downarrow q_2(t-1) \\ q_1(t) = x(t) \sim q_1(t-1) \\ q_2(t) = x(t) \vee q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.28. $\varphi : \begin{cases} y(t) = (x(t)q_1(t-1)) \mid q_2(t-1) \\ q_1(t) = x(t) \oplus q_1(t-1) \\ q_2(t) = x(t) \to q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.29. $\varphi : \begin{cases} y(t) = x(t) \sim (q_1(t-1) \to q_2(t-1)) \\ q_1(t) = x(t)(x(t) \vee q_1(t-1)) \\ q_2(t) = x(t) \oplus q_2(t-1) \\ q_1(0) = q_2(0) = 0 \end{cases}$

5.30. $\varphi : \begin{cases} y(t) = x(t) \sim (q_1(t-1) \mid q_2(t-1)) \\ q_1(t) = \overline{x(t)} \to q_1(t-1) \\ q_2(t) = q_2(t-1) \to x(t) \\ q_1(0) = q_2(0) = 1 \end{cases}$

6. Проверить однозначную декодируемость кода C.

6.1. $C = \{1001, 012, 0120, 112, 12, 10, 02\}$

6.2. $C = \{1000, 022, 221, 12, 2012, 00, 20\}$

6.3. $C = \{12, 2100, 0212, 2010, 01, 11, 010\}$

6.4. $C = \{011, 01, 22, 122, 21, 0220, 1011\}$

6.5. $C = \{200, 12, 202, 112, 210, 11, 20, 212\}$

6.6. $C = \{02, 10, 121, 1022, 102, 11, 001, 0211\}$

6.7. $C = \{02, 0222, 22, 12, 0100, 11, 221, 0022\}$

6.8. $C = \{0210, 22, 010, 20, 01, 001, 0021\}$

6.9. $C = \{2221, 000, 00, 01, 22, 10, 0012, 011\}$

6.10. $C = \{00, 22, 221, 02, 220, 121, 222, 100\}$

6.11. $C = \{21, 10, 002, 2110, 1020, 0012, 200\}$

6.12. $C = \{20, 01, 1000, 0002, 12, 22, 11, 1112\}$

6.13. $C = \{01, 122, 10, 0122, 121, 22, 200, 012\}$

6.14. $C = \{112, 0210, 02, 21, 11, 221, 212, 1211\}$

6.15. $C = \{1000, 222, 001, 02, 2021, 22, 210\}$

6.16. $C = \{0220, 20, 1021, 12, 02, 00, 111, 1110\}$

6.17. $C = \{10, 00, 11, 0021, 2002, 002, 121\}$

6.18. $C = \{1122, 11, 1100, 122, 001, 2211\}$

6.19. $C = \{21, 10, 22, 0111, 11, 2201, 020, 2011\}$

6.20. $C = \{21, 2210, 02, 122, 0221, 012, 211\}$

6.21. $C = \{200, 22, 1122, 10, 2110, 1022, 0222\}$

6.22. $C = \{112, 210, 100, 11, 10, 001, 20, 1111\}$

6.23. $C = \{112, 022, 12, 221, 2220, 0012, 00\}$

6.24. $C = \{201, 0001, 01, 12, 10, 21, 220, 22\}$

6.25. $C = \{022, 22, 0000, 00, 0220, 210, 112\}$

6.26. $C = \{11, 20, 2110, 10, 00, 011, 202, 1222\}$

6.27. $C = \{2210, 21, 222, 0222, 0220, 221\}$

6.28. $C = \{011, 0000, 00, 0122, 21, 22, 022\}$

6.29. $C = \{00, 11, 0022, 21, 20, 002, 02, 001\}$

6.30. $C = \{1201, 20, 201, 0201, 120, 01, 200\}$

7. Проверить, является ли B кодом ровно одного сообщения в кодировании C.

7.1. $C = \{1201, 0110, 110, 00, 212, 10, 21\}$, $B = 12012121102100212212$

7.2. $C = \{022, 22, 120, 2011, 21, 00, 0000\}$, $B = 222011000020112202022$

7.3. $C = \{1000, 21, 22, 222, 12, 0101, 0202\}$, $B = 12212222020202022220202$

7.4. $C = \{11, 2102, 01, 1221, 0122, 22, 020\}$, $B = 2201222102012201221221$

7.5. $C = \{101, 21, 20, 102, 221, 00, 01, 010\}$, $B = 000101010100011022001$

7.6. $C = \{01, 20, 1120, 12, 012, 02, 21, 100\}$, $B = 100211120100011120012$

7.7. $C = \{0202, 02, 210, 21, 2200, 00, 001\}$, $B = 00121022000202001022200$

7.8. $C = \{10, 1212, 2022, 21, 100, 212, 201\}$, $B = 20121221121221100212$

7.9. $C = \{20, 22, 0200, 1112, 0222, 2002\}$, $B = 20022002111202002002002$

7.10. $C = \{120, 20, 221, 122, 22, 2201, 02, 10\}$, $B = 12222202020222221122122$

7.11. $C = \{1210, 00, 200, 21, 111, 121, 021\}$, $B = 02121121212001111212200$

7.12. $C = \{20, 02, 2120, 010, 120, 0221, 102\}$, $B = 20212021200221020102010102$

7.13. $C = \{02, 1102, 21, 0100, 020, 002, 0220\}$, $B = 022021110211021102110211021102$

7.14. $C = \{20, 21, 2020, 12, 01, 11, 210, 201\}$, $B = 2020202020212100112201$

7.15. $C = \{102, 112, 12, 2210, 00, 11, 121, 2120\}$, $B = 121112121112221022102210$

7.16. $C = \{22, 022, 212, 20, 1011, 02, 211, 2200\}$, $B = 2010111011212222112122$

7.17. $C = \{12, 0110, 110, 20, 00, 10, 02, 22, 200\}$, $B = 110121100020022001102200110$

7.18. $C = \{2011, 201, 220, 01, 12, 0201, 0021\}$, $B = 2200021201120122020112$

7.19. $C = \{1120, 22, 0100, 021, 100, 220, 2202\}$, $B = 22112022011200100021$

7.20. $C = \{211, 22, 011, 1212, 21, 1100, 121\}$, $B = 221212112112112101111100$

7.21. $C = \{21, 22, 122, 02, 0011, 2111, 1220\}$, $B = 00111220220011220011$

7.22. $C = \{01, 001, 1022, 120, 12, 010, 211\}$, $B = 120102212121200101010$

7.23. $C = \{20, 121, 22, 0011, 01, 1100, 10, 001\}$, $B = 00120110012120012201$

7.24. $C = \{00, 000, 12, 20, 22, 0202, 2110, 01\}$, $B = 200000000021100020000$

7.25. $C = \{00, 12, 22, 0021, 01, 100, 11, 222\}$, $B = 01100110021122222100$

7.26. $C = \{2101, 002, 12, 120, 21, 1002, 122\}$, $B = 122122120002122121002$

7.27. $C = \{2021, 00, 000, 0112, 11, 200, 21\}$, $B = 212021000000112202100$

7.28. $C = \{12, 011, 210, 202, 21, 2112, 112\}$, $B = 1201111201121210011112$

7.29. $C = \{0012, 20, 210, 220, 2121, 2102\}$, $B = 21022102202102210202121$

7.30. $C = \{21, 0011, 20, 2122, 220, 0220, 211\}$, $B = 212221022021102200220$

8. Построить двоичный префиксный код с заданной последовательностью длин кодовых слов L.

8.1. $L = (3, 3, 3, 3)$

8.2. $L = (1, 2, 5, 6)$

8.3. $L = (3, 4, 4, 4)$

8.4. $L = (2, 2, 2, 3)$

8.5. $L = (1, 3, 3, 5)$

8.6. $L = (2, 3, 3, 4)$

8.7. $L = (3, 4, 4, 5)$

8.8. $L = (1, 2, 5, 5)$

8.9. $L = (3, 3, 4, 5)$

8.10. $L = (3, 4, 6, 6)$

8.11. $L = (3, 5, 5, 5)$

8.12. $L = (3, 3, 3, 4)$

8.13. $L = (1, 3, 4, 5)$

8.14. $L = (1, 2, 3, 6)$

8.15. $L = (3, 4, 5, 6)$

8.16. $L = (1, 4, 5, 6)$

8.17. $L = (2, 2, 3, 3)$

8.18. $L = (1, 2, 4, 4)$

8.19. $L = (2, 3, 4, 5)$

8.20. $L = (2, 2, 3, 4)$

8.21. $L = (1, 3, 3, 3)$

8.22. $L = (2, 2, 2, 5)$

8.23. $L = (1, 2, 3, 5)$

8.24. $L = (3, 4, 5, 5)$

8.25. $L = (1, 3, 3, 4)$

8.26. $L = (2, 3, 3, 3)$

8.27. $L = (1, 4, 4, 4)$

8.28. $L = (2, 2, 2, 4)$

8.29. $L = (2, 3, 4, 4)$

8.30. $L = (1, 2, 3, 4)$

9. Построить двоичный префиксный код с заданной последовательностью длин кодовых слов L.

9.1. $L = (2, 2, 2, 5, 6, 7)$

9.2. $L = (3, 3, 3, 4, 4, 4)$

9.3. $L = (3, 4, 4, 5, 5, 5)$

9.4. $L = (2, 2, 3, 4, 5, 6)$

9.5. $L = (3, 4, 5, 6, 6, 7)$

9.6. $L = (2, 2, 3, 3, 3, 4)$

9.7. $L = (1, 2, 5, 6, 7, 7)$

9.8. $L = (2, 3, 4, 4, 5, 5)$

9.9. $L = (3, 4, 5, 5, 6, 6)$

9.10. $L = (2, 3, 4, 5, 6, 6)$

9.11. $L = (2, 3, 3, 4, 4, 4)$

9.12. $L = (1, 2, 3, 4, 5, 6)$

9.13. $L = (1, 2, 4, 4, 5, 6)$

9.14. $L = (3, 3, 4, 5, 5, 5)$

9.15. $L = (3, 4, 4, 4, 5, 5)$

9.16. $L = (2, 3, 4, 5, 6, 7)$

9.17. $L = (3, 4, 4, 4, 4, 5)$

9.18. $L = (1, 3, 4, 4, 5, 6)$

9.19. $L = (2, 3, 4, 4, 4, 4)$

9.20. $L = (2, 2, 3, 3, 4, 4)$

9.21. $L = (3, 3, 3, 4, 5, 5)$

9.22. $L = (3, 3, 4, 4, 4, 4)$

9.23. $L = (1, 3, 3, 4, 5, 6)$

9.24. $L = (3, 3, 4, 4, 5, 5)$

9.25. $L = (2, 3, 3, 4, 4, 5)$

9.26. $L = (3, 3, 3, 3, 3, 4)$

9.27. $L = (3, 4, 5, 6, 7, 7)$

9.28. $L = (2, 3, 4, 4, 4, 5)$

9.29. $L = (1, 2, 3, 5, 5, 6)$

9.30. $L = (2, 2, 2, 5, 6, 6)$

10. Построить q-ичный префиксный код ($q = 3$) с заданной последовательностью длин кодовых слов L.

10.1. $L = (2, 3, 3, 3)$

10.2. $L = (2, 2, 2, 3)$

10.3. $L = (3, 3, 3, 5)$

10.4. $L = (2, 2, 3, 3)$

10.5. $L = (1, 3, 3, 4)$

10.6. $L = (3, 4, 4, 5)$

10.7. $L = (1, 1, 2, 4)$

10.8. $L = (3, 3, 3, 3)$

10.9. $L = (1, 1, 4, 4)$

10.10. $L = (1, 2, 2, 3)$

10.11. $L = (1, 1, 2, 5)$

10.12. $L = (3, 4, 4, 4)$

10.13. $L = (1, 1, 2, 2)$

10.14. $L = (3, 3, 4, 5)$

10.15. $L = (1, 1, 3, 3)$

10.16. $L = (3, 4, 5, 6)$

10.17. $L = (2, 2, 3, 4)$

10.18. $L = (3, 3, 4, 4)$

10.19. $L = (3, 3, 3, 4)$

10.20. $L = (1, 2, 3, 4)$

10.21. $L = (1, 2, 2, 2)$

10.22. $L = (2, 3, 4, 4)$

10.23. $L = (1, 1, 3, 4)$

10.24. $L = (1, 2, 3, 3)$

10.25. $L = (2, 2, 2, 4)$

10.26. $L = (2, 3, 3, 4)$

10.27. $L = (2, 2, 2, 5)$

10.28. $L = (2, 2, 2, 2)$

10.29. $L = (1, 1, 2, 3)$

10.30. $L = (3, 4, 5, 5)$

11. Построить q-ичный префиксный код ($q = 3$) с заданной последовательностью длин кодовых слов L.

11.1. $L = (3, 3, 3, 3, 3, 3)$

11.2. $L = (3, 3, 3, 3, 3, 5)$

11.3. $L = (3, 4, 5, 6, 7, 8)$

11.4. $L = (1, 2, 3, 3, 4, 4)$

11.5. $L = (3, 3, 4, 4, 5, 5)$

11.6. $L = (2, 3, 3, 4, 4, 4)$

11.7. $L = (3, 4, 5, 5, 5, 6)$

11.8. $L = (2, 3, 4, 4, 5, 6)$

11.9. $L = (1, 2, 2, 3, 4, 4)$

11.10. $L = (2, 2, 2, 2, 2, 2)$

11.11. $L = (2, 2, 3, 3, 3, 4)$

11.12. $L = (1, 2, 2, 2, 3, 3)$

11.13. $L = (2, 2, 2, 2, 2, 3)$

11.14. $L = (2, 2, 3, 3, 3, 3)$

11.15. $L = (1, 1, 2, 2, 3, 4)$

11.16. $L = (3, 3, 3, 3, 4, 5)$

11.17. $L = (1, 2, 2, 2, 3, 4)$

11.18. $L = (3, 4, 4, 4, 4, 4)$

11.19. $L = (1, 2, 2, 3, 3, 4)$

11.20. $L = (3, 4, 5, 6, 6, 7)$

11.21. $L = (2, 3, 3, 3, 3, 3)$

11.22. $L = (2, 3, 4, 5, 5, 5)$

11.23. $L = (1, 2, 2, 2, 2, 2)$

11.24. $L = (3, 3, 4, 5, 5, 6)$

11.25. $L = (1, 2, 3, 4, 5, 5)$

11.26. $L = (2, 2, 2, 3, 3, 3)$

11.27. $L = (2, 3, 4, 4, 4, 4)$

11.28. $L = (1, 2, 3, 4, 4, 4)$

11.29. $L = (3, 3, 3, 4, 4, 4)$

11.30. $L = (3, 4, 4, 4, 5, 5)$

12. Построить оптимальный двоичный код для заданного распределения вероятностей P.

12.1. $P = (0,37;\ 0,13;\ 0,14;\ 0,19;\ 0,11;\ 0,06)$

12.2. $P = (0,06;\ 0,32;\ 0,17;\ 0,18;\ 0,03;\ 0,24)$

12.3. $P = (0,62;\ 0,23;\ 0,09;\ 0,01;\ 0,03;\ 0,02)$

12.4. $P = (0,58;\ 0,17;\ 0,14;\ 0,07;\ 0,02;\ 0,02)$

12.5. $P = (0,55;\ 0,01;\ 0,12;\ 0,04;\ 0,12;\ 0,16)$

12.6. $P = (0,44;\ 0,08;\ 0,24;\ 0,09;\ 0,01;\ 0,14)$

12.7. $P = (0,55;\ 0,18;\ 0,07;\ 0,11;\ 0,04;\ 0,05)$

12.8. $P = (0,51;\ 0,03;\ 0,14;\ 0,07;\ 0,13;\ 0,12)$

12.9. $P = (0,54;\ 0,07;\ 0,13;\ 0,05;\ 0,06;\ 0,15)$

12.10. $P = (0,44;\ 0,26;\ 0,01;\ 0,18;\ 0,01;\ 0,1)$

12.11. $P = (0,62;\ 0,08;\ 0,02;\ 0,01;\ 0,03;\ 0,24)$

12.12. $P = (0,04;\ 0,3;\ 0,17;\ 0,3;\ 0,03;\ 0,16)$

12.13. $P = (0,45;\ 0,01;\ 0,26;\ 0,17;\ 0,03;\ 0,08)$

12.14. $P = (0,06;\ 0,44;\ 0,31;\ 0,03;\ 0,04;\ 0,12)$

12.15. $P = (0,28;\ 0,32;\ 0,13;\ 0,18;\ 0,06;\ 0,03)$

12.16. $P = (0,51;\ 0,16;\ 0,1;\ 0,13;\ 0,06;\ 0,04)$

12.17. $P = (0,6;\ 0,09;\ 0,12;\ 0,02;\ 0,08;\ 0,09)$

12.18. $P = (0,66;\ 0,05;\ 0,06;\ 0,01;\ 0,1;\ 0,12)$

12.19. $P = (0,05;\ 0,63;\ 0,05;\ 0,13;\ 0,06;\ 0,08)$

12.20. $P = (0,41;\ 0,28;\ 0,03;\ 0,17;\ 0,07;\ 0,04)$

12.21. $P = (0,27;\ 0,04;\ 0,05;\ 0,17;\ 0,12;\ 0,35)$

12.22. $P = (0,25;\ 0,16;\ 0,2;\ 0,03;\ 0,03;\ 0,33)$

12.23. $P = (0,18;\ 0,47;\ 0,02;\ 0,21;\ 0,01;\ 0,11)$

12.24. $P = (0,3;\ 0,09;\ 0,23;\ 0,19;\ 0,05;\ 0,14)$

12.25. $P = (0,54;\ 0,2;\ 0,09;\ 0,07;\ 0,06;\ 0,04)$

12.26. $P = (0,1;\ 0,12;\ 0,1;\ 0,24;\ 0,04;\ 0,4)$

12.27. $P = (0,45;\ 0,33;\ 0,01;\ 0,13;\ 0,01;\ 0,07)$

12.28. $P = (0,61;\ 0,22;\ 0,05;\ 0,08;\ 0,01;\ 0,03)$

12.29. $P = (0,16;\ 0,05;\ 0,46;\ 0,07;\ 0,14;\ 0,12)$

12.30. $P = (0,34;\ 0,37;\ 0,04;\ 0,09;\ 0,1;\ 0,06)$

13. Построить оптимальный q-ичный код (q=3) для заданного распределения вероятностей P.

13.1. $P = (0,09;\ 0,04;\ 0,23;\ 0,2;\ 0,28;\ 0,16)$

13.2. $P = (0,57;\ 0,26;\ 0,07;\ 0,01;\ 0,05;\ 0,04)$

13.3. $P = (0,62;\ 0,03;\ 0,22;\ 0,05;\ 0,02;\ 0,06)$

13.4. $P = (0,27;\ 0,38;\ 0,09;\ 0,07;\ 0,09;\ 0,1)$

13.5. $P = (0,58;\ 0,06;\ 0,1;\ 0,08;\ 0,11;\ 0,07)$

13.6. $P = (0,08;\ 0,17;\ 0,18;\ 0,17;\ 0,2;\ 0,2)$

13.7. $P = (0,31;\ 0,05;\ 0,13;\ 0,09;\ 0,24;\ 0,18)$

13.8. $P = (0,01;\ 0,62;\ 0,06;\ 0,18;\ 0,02;\ 0,11)$

13.9. $P = (0,47;\ 0,35;\ 0,04;\ 0,04;\ 0,02;\ 0,08)$

13.10. $P = (0,56;\ 0,29;\ 0,01;\ 0,06;\ 0,01;\ 0,07)$

13.11. $P = (0,55;\ 0,05;\ 0,05;\ 0,22;\ 0,09;\ 0,04)$

13.12. $P = (0,37;\ 0,32;\ 0,2;\ 0,01;\ 0,03;\ 0,07)$

13.13. $P = (0,65;\ 0,15;\ 0,01;\ 0,01;\ 0,07;\ 0,11)$

13.14. $P = (0,1;\ 0,14;\ 0,18;\ 0,22;\ 0,23;\ 0,13)$

13.15. $P = (0,15;\ 0,25;\ 0,27;\ 0,17;\ 0,06;\ 0,1)$

13.16. $P = (0,61;\ 0,11;\ 0,1;\ 0,06;\ 0,04;\ 0,08)$

13.17. $P = (0,36;\ 0,29;\ 0,22;\ 0,04;\ 0,04;\ 0,05)$

13.18. $P = (0,15;\ 0,55;\ 0,06;\ 0,13;\ 0,07;\ 0,04)$

13.19. $P = (0,66;\ 0,09;\ 0,07;\ 0,01;\ 0,09;\ 0,08)$

13.20. $P = (0,5;\ 0,19;\ 0,02;\ 0,04;\ 0,05;\ 0,2)$

13.21. $P = (0,2;\ 0,47;\ 0,13;\ 0,09;\ 0,04;\ 0,07)$

13.22. $P = (0,41;\ 0,3;\ 0,16;\ 0,07;\ 0,01;\ 0,05)$

13.23. $P = (0,33;\ 0,24;\ 0,04;\ 0,09;\ 0,14;\ 0,16)$

13.24. $P = (0,53;\ 0,11;\ 0,13;\ 0,01;\ 0,15;\ 0,07)$

13.25. $P = (0,07;\ 0,47;\ 0,22;\ 0,12;\ 0,05;\ 0,07)$

13.26. $P = (0,12;\ 0,43;\ 0,28;\ 0,08;\ 0,05;\ 0,04)$

13.27. $P = (0,61;\ 0,1;\ 0,15;\ 0,05;\ 0,05;\ 0,04)$

13.28. $P = (0,5;\ 0,13;\ 0,11;\ 0,04;\ 0,02;\ 0,2)$

13.29. $P = (0,63;\ 0,17;\ 0,05;\ 0,04;\ 0,04;\ 0,07)$

13.30. $P = (0,23;\ 0,4;\ 0,05;\ 0,16;\ 0,08;\ 0,08)$

14. Построить по методу Хэмминга кодовое слово для сообщения α.

14.1. $\alpha = 10000$

14.2. $\alpha = 01000$

14.3. $\alpha = 11000$

14.4. $\alpha = 00100$

14.5. $\alpha = 10100$

14.6. $\alpha = 01100$

14.7. $\alpha = 11100$

14.8. $\alpha = 00010$

14.9. $\alpha = 10010$

14.10. $\alpha = 01010$

14.11. $\alpha = 11010$

14.12. $\alpha = 00110$

14.13. $\alpha = 10110$

14.14. $\alpha = 01110$

14.15. $\alpha = 11110$

14.16. $\alpha = 00001$

14.17. $\alpha = 10001$

14.18. $\alpha = 01001$

14.19. $\alpha = 11001$

14.20. $\alpha = 00101$

14.21. $\alpha = 10101$

14.22. $\alpha = 01101$

14.23. $\alpha = 11101$

14.24. $\alpha = 00011$

14.25. $\alpha = 10011$

14.26. $\alpha = 01011$

14.27. $\alpha = 11011$

14.28. $\alpha = 00111$

14.29. $\alpha = 10111$

14.30. $\alpha = 01111$

15. По кодовому слову β, построенному по методу Хэмминга, восстановить исходное сообщение, если известно, что произошло не более одной ошибки.

15.1. $\beta = 100000000$
15.2. $\beta = 001000000$
15.3. $\beta = 111000000$
15.4. $\beta = 010100000$
15.5. $\beta = 101100000$
15.6. $\beta = 000010000$
15.7. $\beta = 110010000$
15.8. $\beta = 011010000$
15.9. $\beta = 100110000$
15.10. $\beta = 001110000$
15.11. $\beta = 111110000$
15.12. $\beta = 010001000$
15.13. $\beta = 101001000$
15.14. $\beta = 000101000$
15.15. $\beta = 110101000$
15.16. $\beta = 011101000$
15.17. $\beta = 100011000$
15.18. $\beta = 001011000$
15.19. $\beta = 111011000$
15.20. $\beta = 010111000$
15.21. $\beta = 101111000$
15.22. $\beta = 000000100$
15.23. $\beta = 110000100$
15.24. $\beta = 011000100$
15.25. $\beta = 100100100$
15.26. $\beta = 001100100$
15.27. $\beta = 111100100$
15.28. $\beta = 010010100$
15.29. $\beta = 101010100$
15.30. $\beta = 000110100$

16. Для кода C определить, сколько ошибок он обнаруживает и сколько исправляет.

16.1. $C = \{11010010, 01010100, 01101100, 10100000\}$
16.2. $C = \{10110000, 11011010, 01000010, 00110110\}$
16.3. $C = \{11011000, 00001101, 00001000, 11000111\}$
16.4. $C = \{00000101, 10110000, 01100111, 01001110\}$
16.5. $C = \{01101110, 10000100, 01010110, 11100011\}$
16.6. $C = \{10111011, 11110110, 00110000, 00000010\}$
16.7. $C = \{10000111, 01111010, 11100100, 00000101\}$
16.8. $C = \{10101000, 01111100, 11011111, 10000000\}$
16.9. $C = \{10111110, 01000010, 10100010, 00101000\}$
16.10. $C = \{01100110, 01001010, 11001001, 00010011\}$
16.11. $C = \{01100011, 00000101, 00011001, 01010011\}$
16.12. $C = \{00010000, 00101101, 01010110, 11100100\}$
16.13. $C = \{01111001, 01011111, 01101111, 11101011\}$
16.14. $C = \{11111110, 01110110, 10100110, 00111001\}$
16.15. $C = \{00011101, 10110100, 00101001, 11000100\}$
16.16. $C = \{10010101, 01010100, 00100001, 10100101\}$
16.17. $C = \{11101001, 10110110, 11000001, 11100010\}$
16.18. $C = \{00100111, 10100011, 11010101, 11001010\}$
16.19. $C = \{11110001, 11010011, 00010011, 01101110\}$
16.20. $C = \{10000101, 01000101, 10000000, 00110110\}$
16.21. $C = \{11101011, 11001110, 00001100, 01001011\}$
16.22. $C = \{00000111, 01101101, 01011110, 00010011\}$
16.23. $C = \{11010011, 10110101, 11111010, 10101100\}$
16.24. $C = \{10111100, 10000000, 10011101, 11100101\}$
16.25. $C = \{00100000, 01010001, 11001101, 10010101\}$
16.26. $C = \{00101100, 01100111, 01001101, 10101000\}$
16.27. $C = \{11000100, 00000100, 01001011, 01110110\}$
16.28. $C = \{00011110, 00100000, 01000110, 01111111\}$
16.29. $C = \{11111110, 01000011, 11110010, 10010110\}$
16.30. $C = \{01110001, 10111111, 01100010, 10110000\}$

17. Определить, сколько ошибок обнаруживает и сколько исправляет код с характеристической функцией f.

17.1. $x_2(x_3 \oplus x_1)(x_3 \oplus x_4)$

17.2. $x_4(x_2 \sim x_1)(x_3 \sim x_2)$

17.3. $x_4 \downarrow ((x_1 \sim x_3) \mid (x_2 \sim x_1))$

17.4. $x_3 \downarrow ((x_1 \sim x_2) \vee (x_1 \sim x_4))$

17.5. $\overline{(x_1 \oplus x_3)}(x_4 \downarrow (x_2 \sim x_1))$

17.6. $x_3((x_4 \oplus x_1) \downarrow (x_2 \oplus x_1))$

17.7. $((x_1 \oplus x_2) \downarrow (x_1 \sim x_3))x_4$

17.8. $((x_3 \sim x_1) \vee (x_1 \sim x_4)) \downarrow x_2$

17.9. $(x_4 \sim x_3)(\overline{x}_1 \downarrow (x_2 \oplus x_4))$

17.10. $(x_1 \vee (x_4 \oplus x_3)) \downarrow (x_4 \sim x_2)$

17.11. $((x_2 \oplus x_3) \vee (x_1 \sim x_3)) \downarrow x_4$

17.12. $(x_4 \mid (x_3 \sim x_2)) \downarrow (x_2 \oplus x_1)$

17.13. $((x_4 \oplus x_1) \to x_3) \downarrow (\overline{x}_1 \sim \overline{x}_2)$

17.14. $(x_2 \mid (x_3 \oplus x_1)) \downarrow (x_4 \oplus x_1)$

17.15. $(x_1 \to (x_3 \oplus x_4)) \downarrow (x_4 \sim x_2)$

17.16. $x_4 \downarrow ((x_1 \sim x_3) \mid (x_2 \oplus x_3))$

17.17. $(x_3 \oplus x_4) \downarrow (x_2 \vee (x_1 \oplus x_3))$

17.18. $x_1 \downarrow ((x_3 \oplus x_4) \mid (x_4 \oplus x_2))$

17.19. $x_3 \downarrow ((x_4 \sim x_1) \to (x_4 \sim x_2))$

17.20. $(x_1 \oplus x_2) \downarrow (x_3 \vee (x_2 \oplus x_4))$

17.21. $(x_2 \downarrow (x_1 \oplus x_4))(x_1 \oplus x_3)$

17.22. $x_2 \downarrow ((x_4 \sim x_1) \mid (x_3 \oplus x_1))$

17.23. $(x_2 \to (x_4 \oplus x_1)) \downarrow (x_3 \oplus x_1)$

17.24. $(x_3 \sim x_1) \downarrow ((x_1 \sim x_4) \to x_2)$

17.25. $(x_1 \vee (x_4 \sim x_3)) \downarrow (x_3 \oplus x_2)$

17.26. $((x_1 \sim x_4) \mid (x_4 \oplus x_3)) \downarrow x_2$

17.27. $x_4((x_3 \oplus x_2) \downarrow (x_2 \sim x_1))$

17.28. $x_1(x_3 \oplus x_2)(x_2 \sim x_1 \sim x_4)$

17.29. $(x_2 \oplus x_3) \downarrow ((x_1 \oplus x_2) \vee x_4)$

17.30. $((x_4 \oplus x_1) \mid x_3) \downarrow (x_1 \sim x_2)$

18. Построить плоское корневое дерево по его коду $\tilde{\alpha}$.

18.1. $\tilde{\alpha} = 000001011111010010 1101$

18.2. $\tilde{\alpha} = 010011010100001111 0011$

18.3. $\tilde{\alpha} = 010000001100011011 1111$

18.4. $\tilde{\alpha} = 000110000101000111 1111$

18.5. $\tilde{\alpha} = 010000011111010000 1111$

18.6. $\tilde{\alpha} = 001101010100110000 1111$

18.7. $\tilde{\alpha} = 000101110001110100 1101$

18.8. $\tilde{\alpha} = 010101000010001101 1111$

18.9. $\tilde{\alpha} = 010100010010100011 1111$

18.10. $\tilde{\alpha} = 000000011010011110 1111$

18.11. $\tilde{\alpha} = 000101110010010011 1101$

18.12. $\tilde{\alpha} = 000011011011010101 0101$

18.13. $\tilde{\alpha} = 001000101011010101 0111$

18.14. $\tilde{\alpha} = 010000010000011111 1111$

18.15. $\tilde{\alpha} = 010100001101110000 1111$

18.16. $\tilde{\alpha} = 010100101011010100 1011$

18.17. $\tilde{\alpha} = 010101010100011000 1111$

18.18. $\tilde{\alpha} = 000001010011101111 0101$

18.19. $\tilde{\alpha} = 010100010100111101 0011$

18.20. $\tilde{\alpha} = 000111001100100110 0111$

18.21. $\tilde{\alpha} = 010000101001101110 1011$

18.22. $\tilde{\alpha} = 010011001010101011 0011$

18.23. $\tilde{\alpha} = 010100011101010000 1111$

18.24. $\tilde{\alpha} = 001101010011001101 0011$

18.25. $\tilde{\alpha} = 000000011111101101 0011$

18.26. $\tilde{\alpha} = 001011010101000101 1101$

18.27. $\tilde{\alpha} = 010101000010110100 1111$

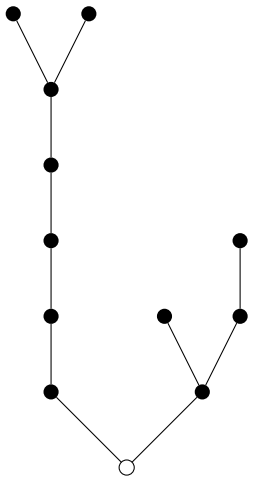
18.28. $\tilde{\alpha} = 010100101100110000 1111$

18.29. $\tilde{\alpha} = 001101010101010101 0011$

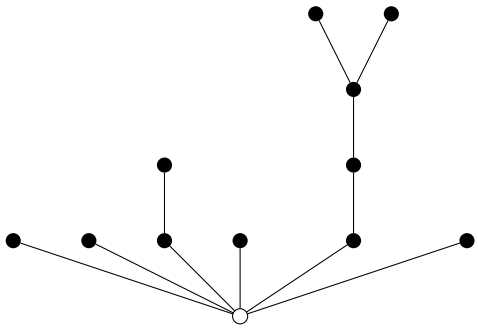
18.30. $\tilde{\alpha} = 001000111011010011 0011$

19. Построить код плоского корневого дерева.

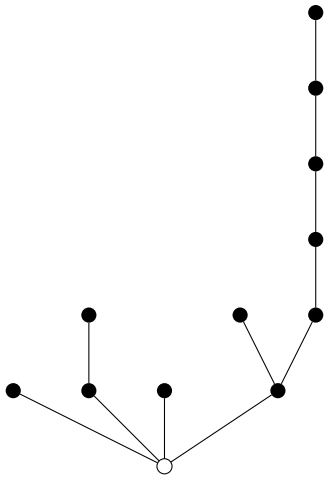
19.1.



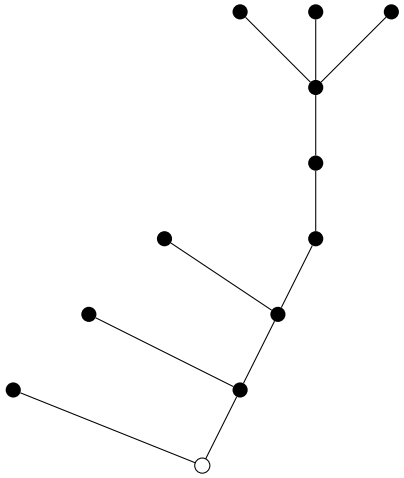
19.2.



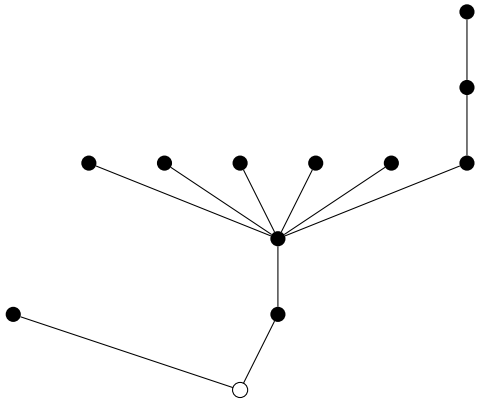
19.3.



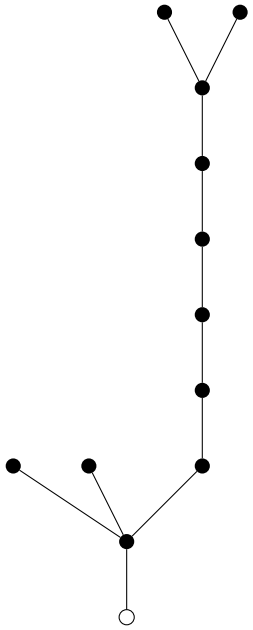
19.4.



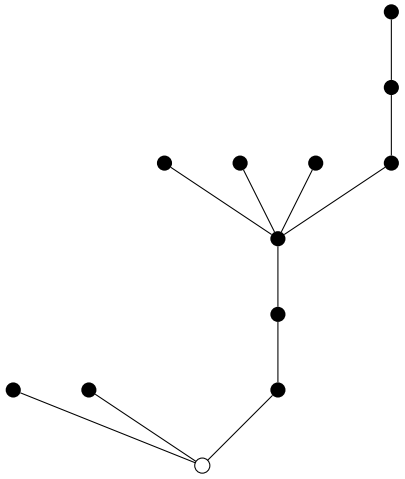
19.5.



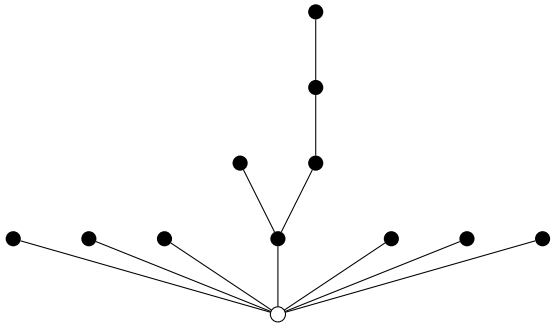
19.6.



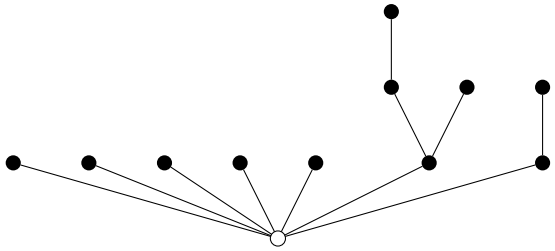
19.7.



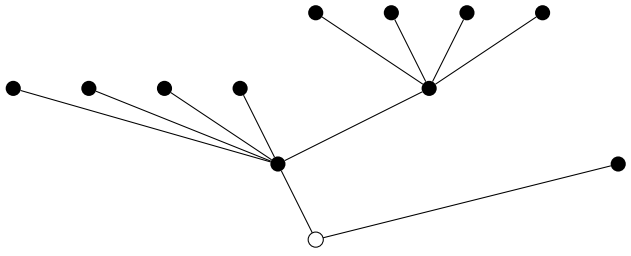
19.8.

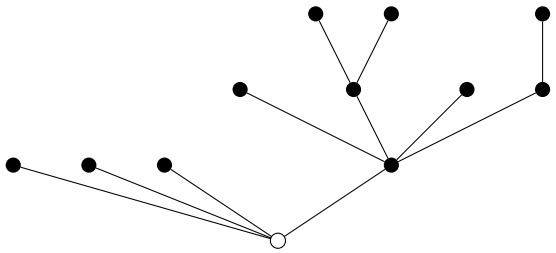


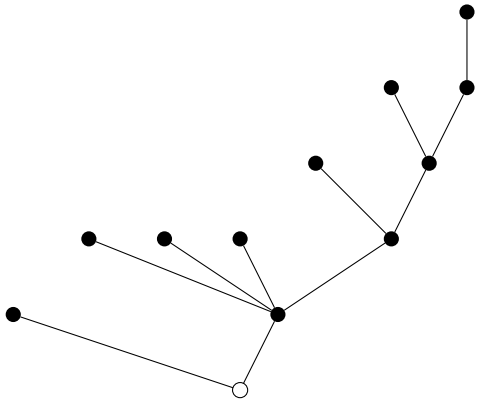
19.9.

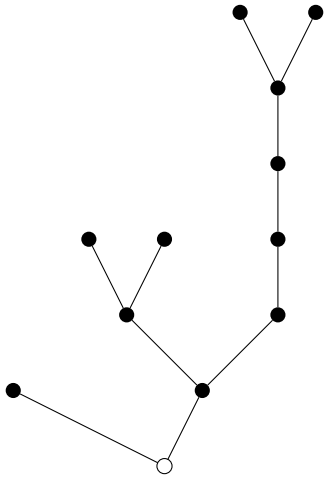


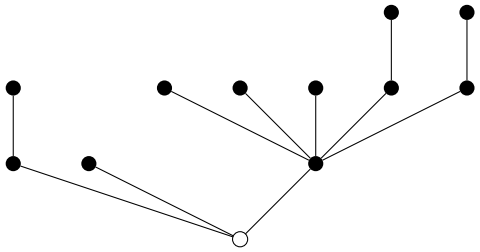
19.10.

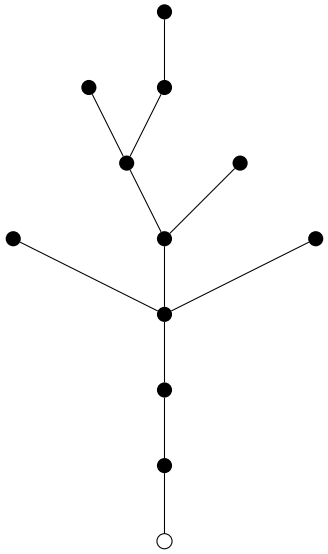


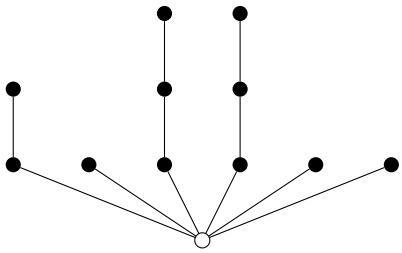
19.11. 

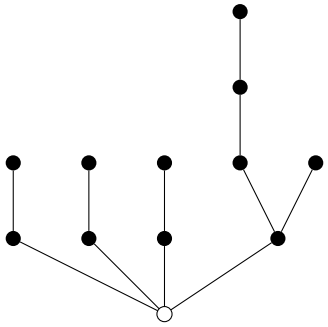
19.12. 

19.13. 

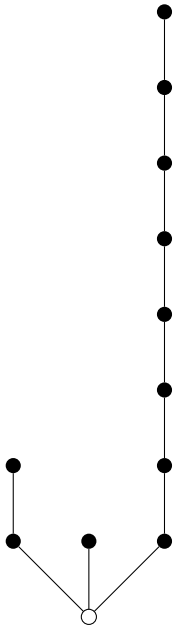
19.14. 

19.15. 

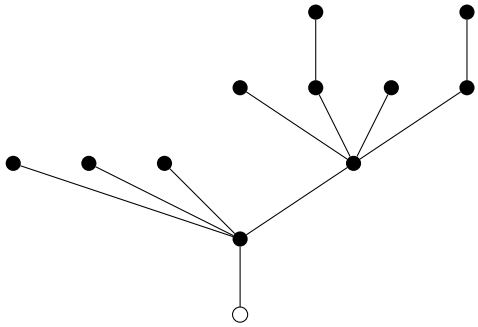
19.16. 

19.17. 

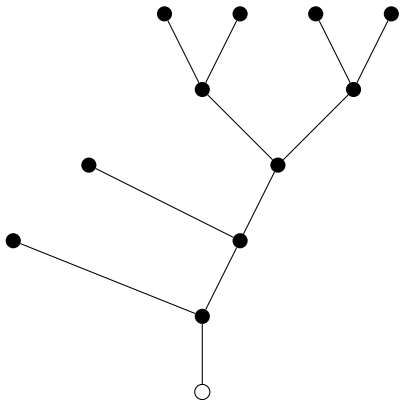
19.18.

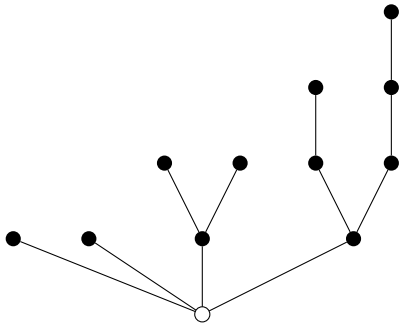


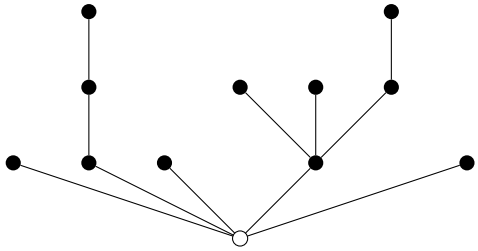
19.19.

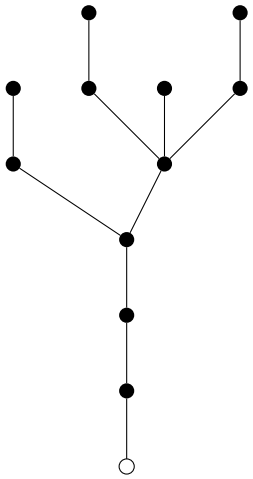


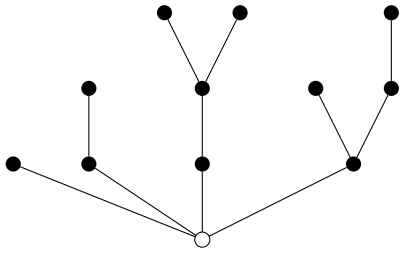
19.20.

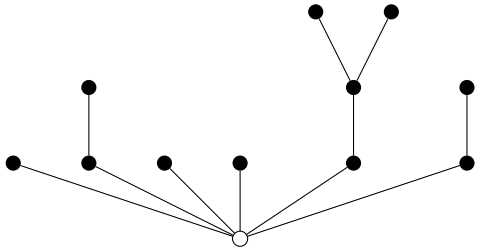


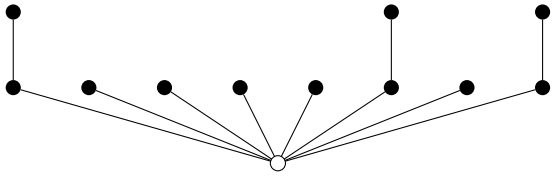
19.21. 

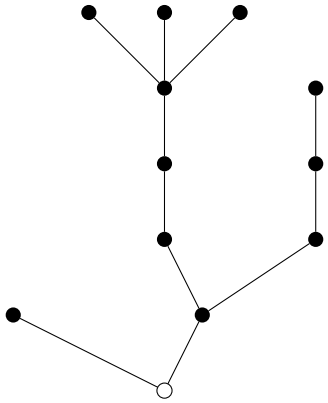
19.22. 

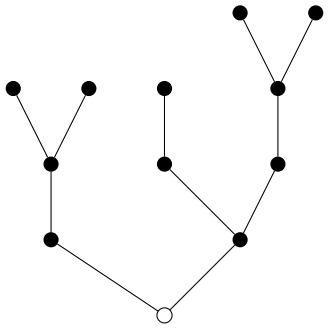
19.23. 

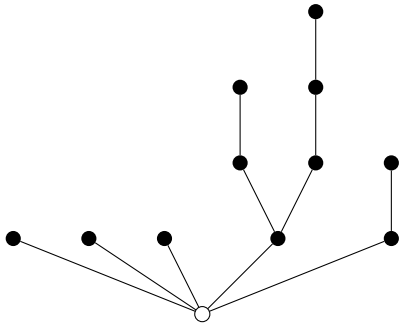
19.24. 

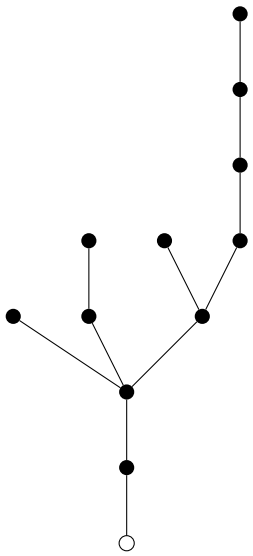
19.25. 

19.26. 

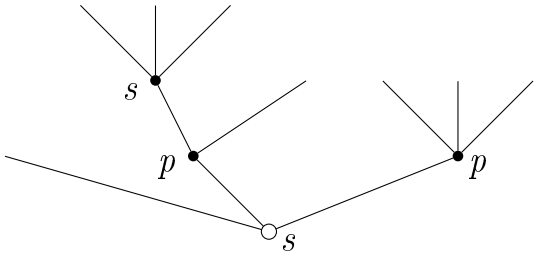
19.27. 

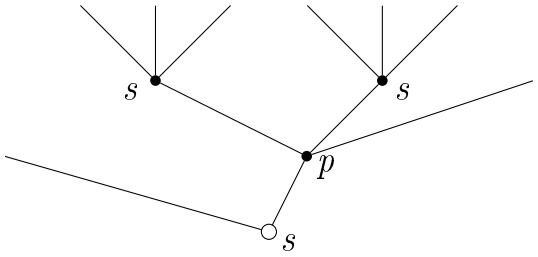
19.28. 

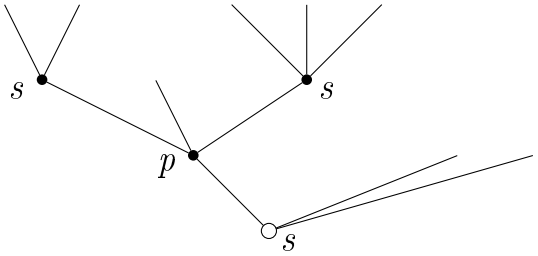
19.29. 

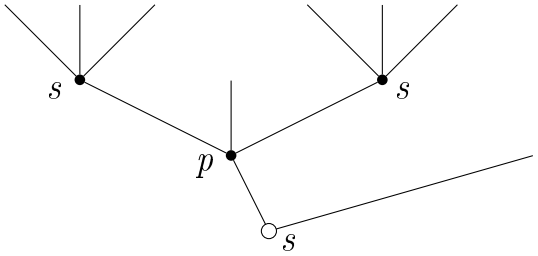
19.30. 

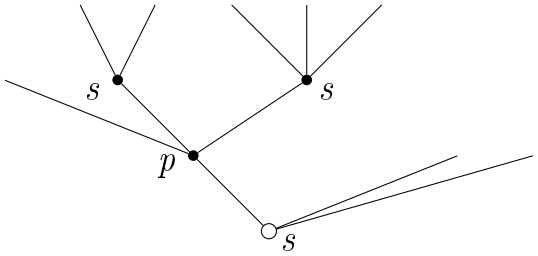
20. По диаграмме расщепления восстановить π-сеть.

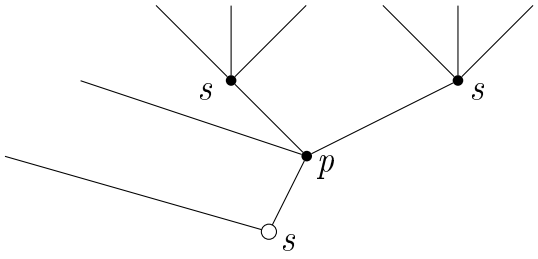
20.1. 

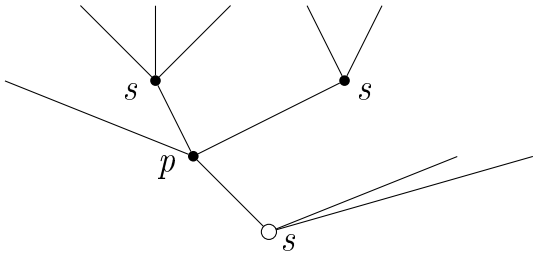
20.2. 

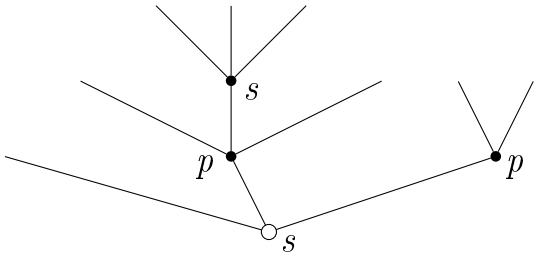
20.3. 

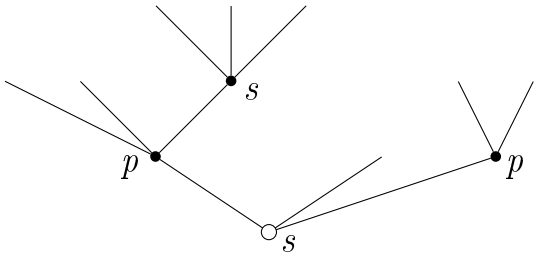
20.4. 

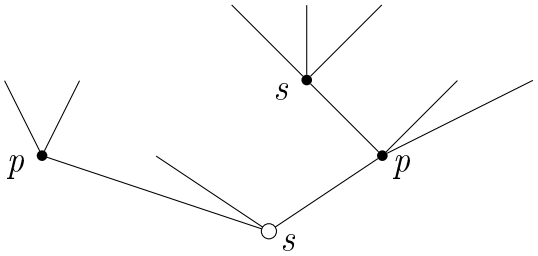
20.5. 

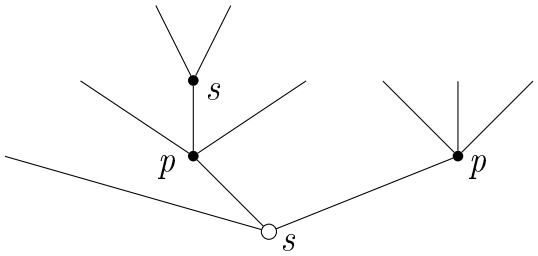
20.6. 

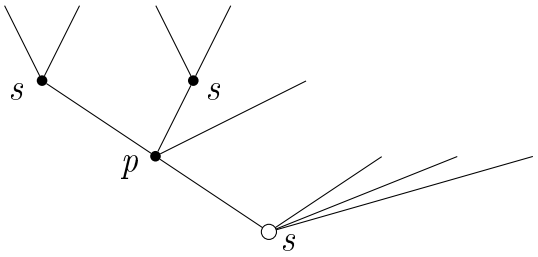
20.7. 

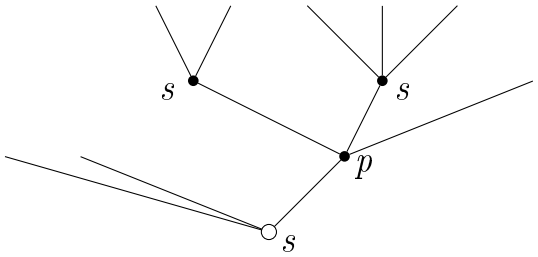
20.8. 

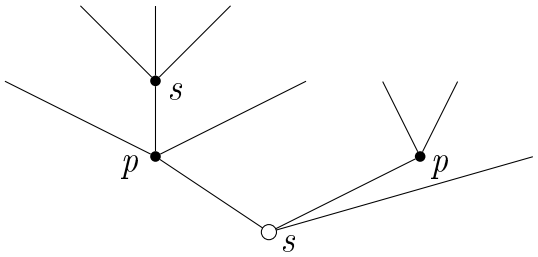
20.9. 

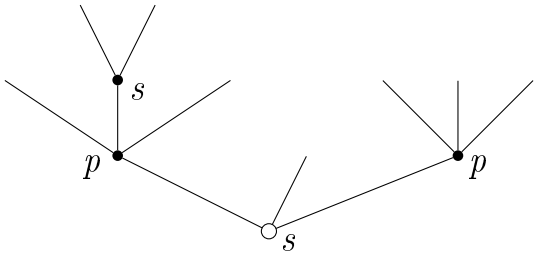
20.10. 

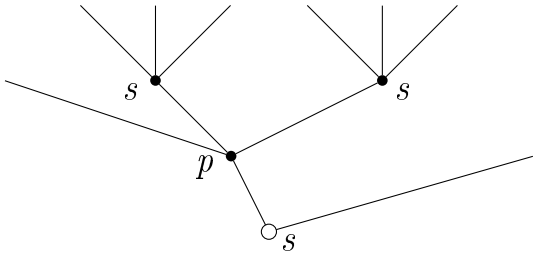
20.11. 

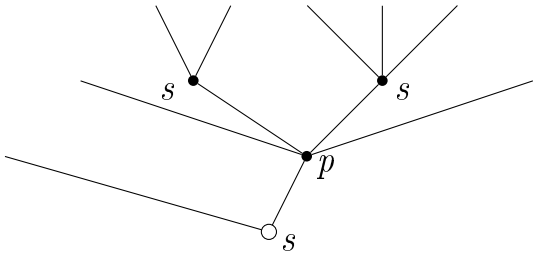
20.12. 

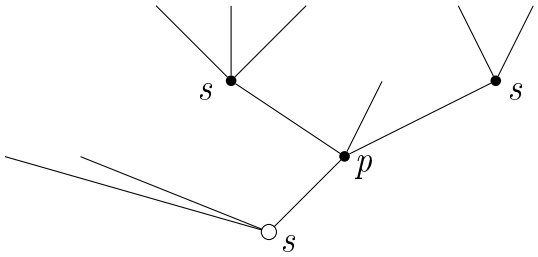
20.13. 

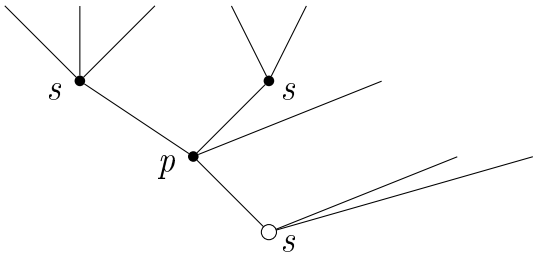
20.14. 

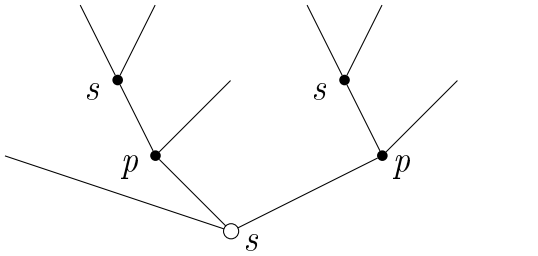
20.15. 

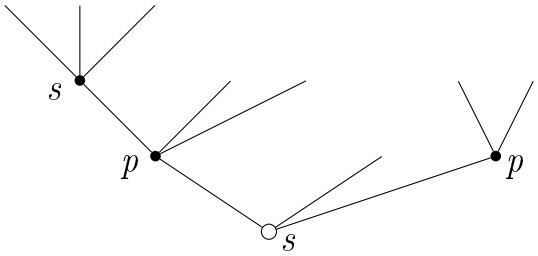
20.16. 

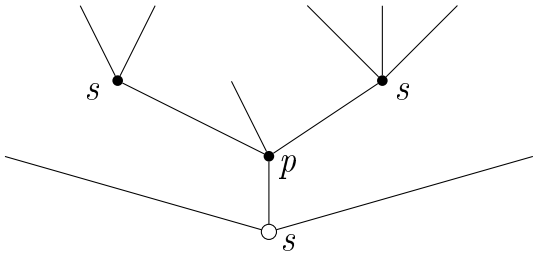
20.17. 

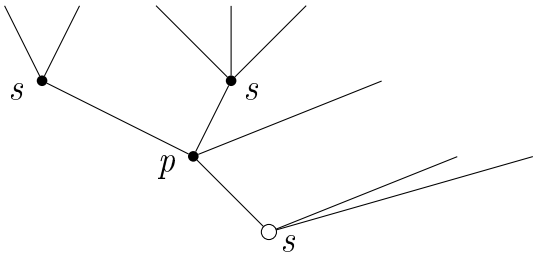
20.18. 

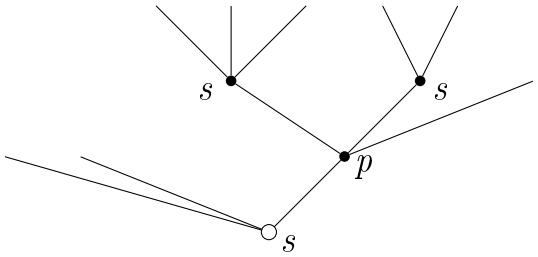
20.19. 

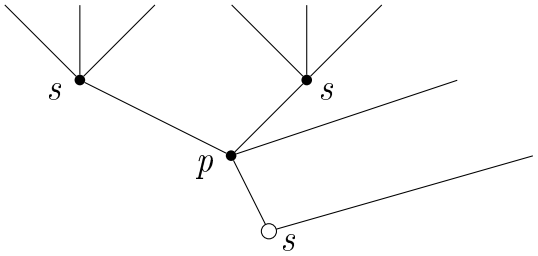
20.20. 

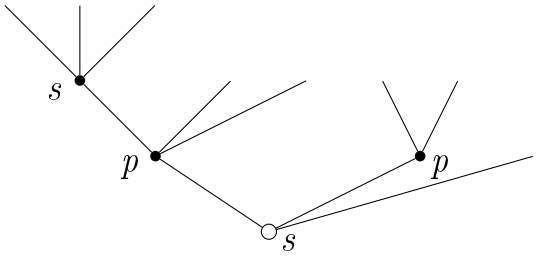
20.21. 

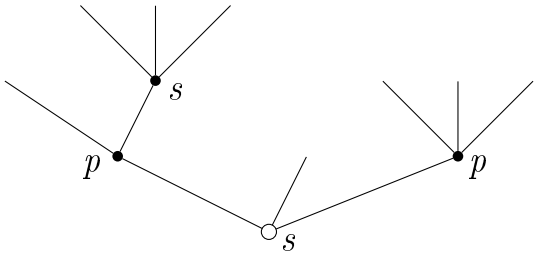
20.22. 

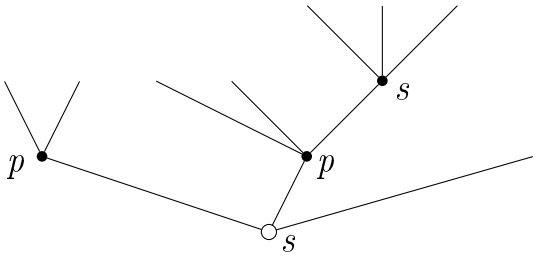
20.23. 

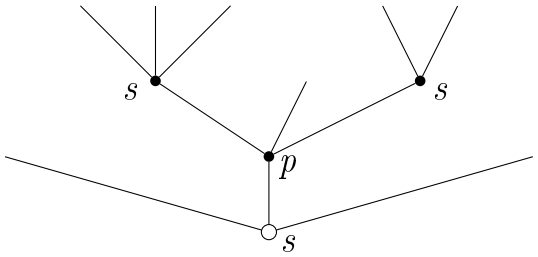
20.24. 

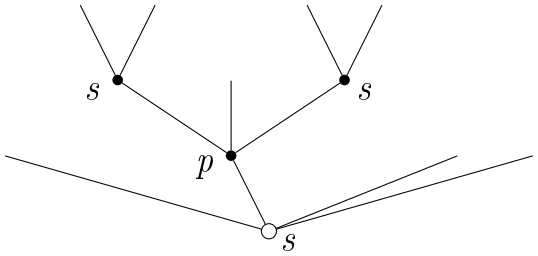
20.25. 

20.26. 

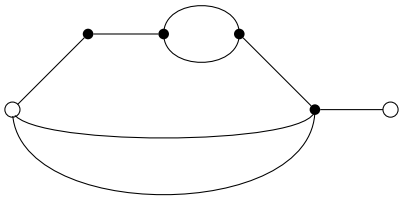
20.27. 

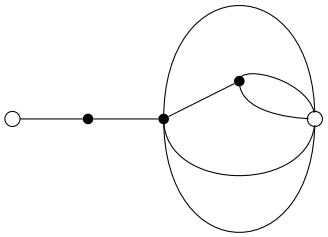
20.28. 

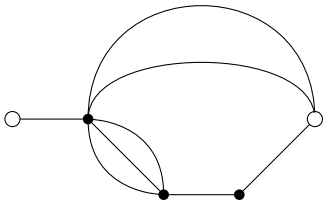
20.29. 

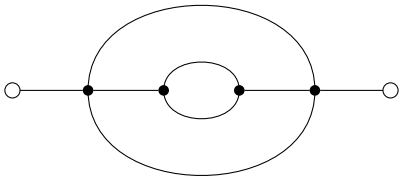
20.30. 

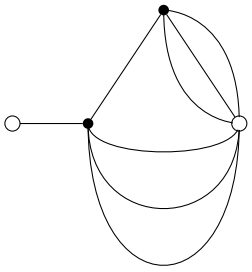
21. Для π-сети построить диаграмму расщепления.

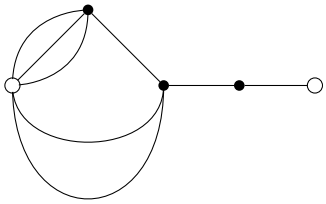
21.1. 

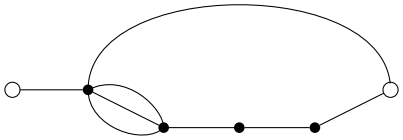
21.2. 

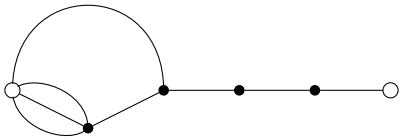
21.3. 

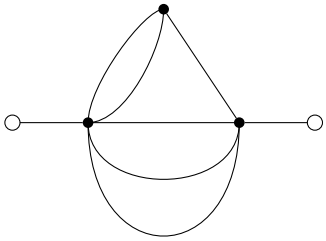
21.4. 

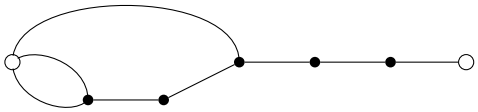
21.5. 

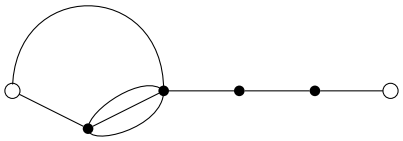
21.6. 

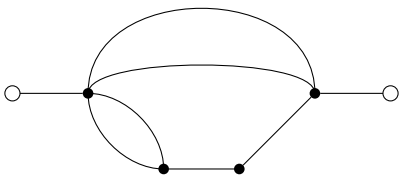
21.7. 

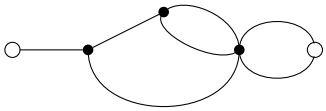
21.8. 

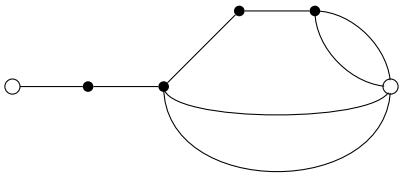
21.9. 

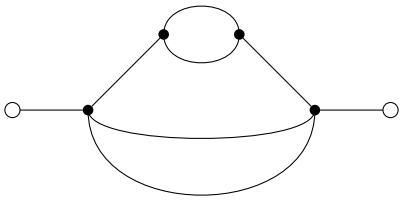
21.10. 

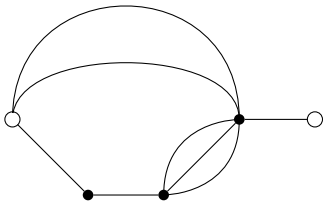
21.11. 

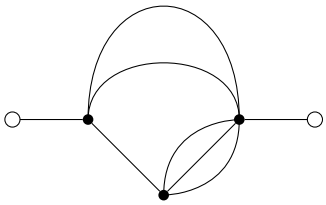
21.12. 

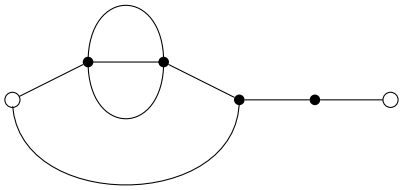
21.13. 

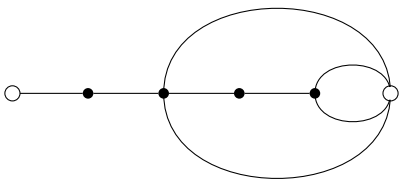
21.14. 

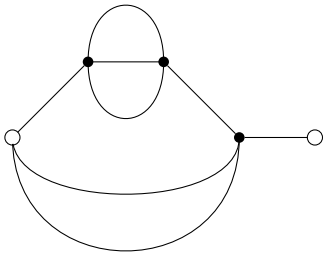
21.15. 

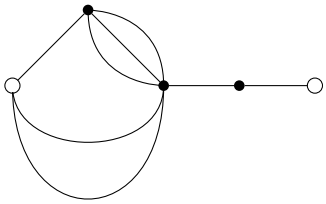
21.16. 

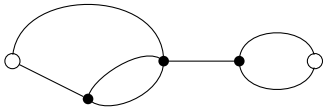
21.17. 

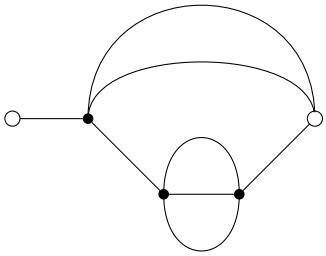
21.18. 

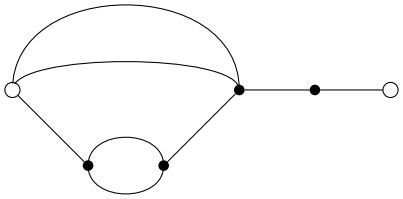
21.19. 

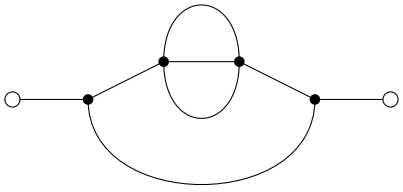
21.20. 

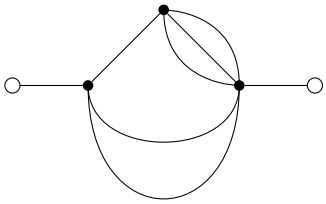
21.21. 

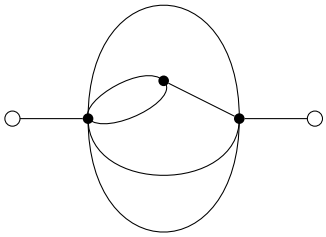
21.22. 

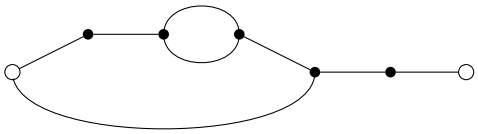
21.23. 

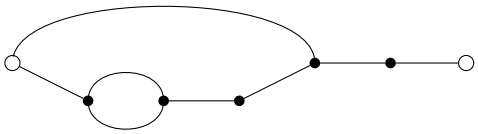
21.24. 

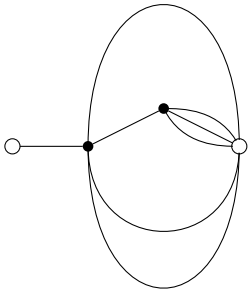
21.25. 

21.26. 

21.27. 

21.28. 

21.29. 

21.30. 

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