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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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. $C = \{122, 1200, 2121, 00, 010, 002, 12\}$

6.2. $C = \{00, 21, 1122, 100, 1022, 001, 1212\}$

6.3. $C = \{2220, 1000, 10, 0212, 010, 12, 01\}$

6.4. $C = \{22, 10, 1200, 11, 1211, 1011, 2002\}$

6.5. $C = \{00, 10, 01, 20, 0010, 002, 211, 200\}$

6.6. $C = \{0012, 12, 11, 1022, 111, 011, 10\}$

6.7. $C = \{001, 10, 2100, 00, 1201, 1000, 02\}$

6.8. $C = \{01, 22, 20, 02, 10, 110, 011, 0211\}$

6.9. $C = \{22, 110, 2121, 0122, 21, 11, 1101\}$

6.10. $C = \{00, 02, 22, 122, 01, 102, 1101, 1221\}$

6.11. $C = \{10, 012, 112, 00, 100, 11, 220, 0101\}$

6.12. $C = \{012, 20, 2210, 020, 110, 02, 2110\}$

6.13. $C = \{110, 01, 1201, 012, 0022, 12, 212\}$

6.14. $C = \{120, 10, 2101, 2122, 2102, 21, 210\}$

6.15. $C = \{112, 20, 1201, 10, 2112, 102, 0222\}$

6.16. $C = \{111, 0110, 12, 01, 21, 00, 02, 10, 0210\}$

6.17. $C = \{221, 0001, 1122, 222, 22, 10, 2011\}$

6.18. $C = \{111, 222, 10, 21, 1011, 0220, 011\}$

6.19. $C = \{202, 0201, 20, 22, 0222, 100, 1020\}$

6.20. $C = \{012, 20, 10, 101, 2110, 01, 220, 02\}$

6.21. $C = \{1212, 00, 11, 122, 12, 202, 2101\}$

6.22. $C = \{202, 22, 122, 010, 120, 222, 01, 102\}$

6.23. $C = \{00, 001, 000, 11, 02, 0110, 12, 2220\}$

6.24. $C = \{0200, 02, 200, 22, 010, 12, 1201\}$

6.25. $C = \{21, 12, 10, 011, 02, 211, 1221, 1112\}$

6.26. $C = \{2111, 1021, 1121, 021, 02, 11, 00\}$

6.27. $C = \{221, 001, 111, 021, 0211, 11, 020\}$

6.28. $C = \{101, 222, 1110, 22, 112, 200, 01\}$

6.29. $C = \{20, 1022, 12, 1211, 220, 102, 010\}$

6.30. $C = \{022, 11, 1022, 010, 20, 201, 0012\}$

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

7.1. $C = \{00, 000, 12, 0201, 122, 02, 20, 1012\}$, $B = 000000000220200020122$

7.2. $C = \{00, 2011, 21, 1100, 20, 0001, 0112\}$, $B = 0011002011212111000112$

7.3. $C = \{202, 102, 200, 02, 11, 01, 000, 011\}$, $B = 200102102020110201000$

7.4. $C = \{11, 110, 111, 10, 101, 21, 02, 2001\}$, $B = 11110110200111200121$

7.5. $C = \{200, 002, 0100, 021, 10, 20, 02, 100\}$, $B = 0100200010001000020210$

7.6. $C = \{202, 111, 11, 021, 01, 112, 02, 020\}$, $B = 1121120200200202101111$

7.7. $C = \{201, 022, 10, 111, 02, 011, 20, 2022\}$, $B = 20120111102011011101111$

7.8. $C = \{1120, 0001, 200, 10, 11, 20, 1112\}$, $B = 00011011201100011120$

7.9. $C = \{201, 22, 212, 21, 102, 012, 222, 121\}$, $B = 221211021021212120 12$

7.10. $C = \{212, 210, 222, 010, 11, 011, 01, 021\}$, $B = 01102102111110101021$

7.11. $C = \{2100, 10, 01, 11, 21, 00, 2101, 2010\}$, $B = 0100211000102110 2100$

7.12. $C = \{122, 01, 0220, 002, 001, 0101, 220\}$, $B = 01011220101022002200220$

7.13. $C = \{0121, 2200, 11, 2101, 01, 21, 2001\}$, $B = 01212101220001212001$

7.14. $C = \{20, 200, 1020, 220, 2001, 11, 10\}$, $B = 11200102201020201110 20$

7.15. $C = \{10, 21, 20, 1220, 02, 1011, 12, 00\}$, $B = 02121020121011021210$

7.16. $C = \{2220, 11, 20, 1002, 22, 00, 0102\}$, $B = 01020102100210021122 20$

7.17. $C = \{02, 12, 0121, 021, 220, 2001, 0202\}$, $B = 01210212001200120012 20$

7.18. $C = \{2101, 12, 120, 00, 101, 112, 10, 001\}$, $B = 00001120121202101120$

7.19. $C = \{1020, 1010, 22, 101, 01, 1102, 00\}$, $B = 11021012211021010 1020$

7.20. $C = \{210, 101, 21, 22, 01, 11, 222, 0211\}$, $B = 11101010211222210222$

7.21. $C = \{2202, 2201, 22, 01, 2002, 200, 02\}$, $B = 22012202220202022202$

7.22. $C = \{21, 0012, 10, 212, 0001, 0011, 1021\}$, $B = 21210000100122100 01000$

7.23. $C = \{02, 1021, 12, 22, 21, 101, 211, 10\}$, $B = 12210210211210102 2102$

7.24. $C = \{1211, 22, 222, 002, 0012, 00, 10\}$, $B = 2220012222002221211 10$

7.25. $C = \{20, 01, 02, 001, 10, 201, 22, 212, 111\}$, $B = 01001022012020100102$

7.26. $C = \{2120, 11, 211, 1112, 2112, 0222\}$, $B = 1111121111022221102 22$

7.27. $C = \{02, 00, 2100, 21, 101, 121, 102, 01\}$, $B = 00022112121000121 00121$

7.28. $C = \{20, 12, 11, 2211, 2101, 111, 2110\}$, $B = 11211021012011121 0120$

7.29. $C = \{021, 201, 022, 10, 222, 21, 212, 12\}$, $B = 02221222222212022212$

7.30. $C = \{11, 1201, 0212, 010, 21, 0201, 1121\}$, $B = 2121010112121120 10201$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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. $\alpha = 10001$

14.2. $\alpha = 01001$

14.3. $\alpha = 11001$

14.4. $\alpha = 00101$

14.5. $\alpha = 10101$

14.6. $\alpha = 01101$

14.7. $\alpha = 11101$

14.8. $\alpha = 10000$

14.9. $\alpha = 01000$

14.10. $\alpha = 11000$

14.11. $\alpha = 00100$

14.12. $\alpha = 10100$

14.13. $\alpha = 01100$

14.14. $\alpha = 11100$

14.15. $\alpha = 00010$

14.16. $\alpha = 10010$

14.17. $\alpha = 01010$

14.18. $\alpha = 11010$

14.19. $\alpha = 00110$

14.20. $\alpha = 10110$

14.21. $\alpha = 01110$

14.22. $\alpha = 11110$

14.23. $\alpha = 00001$

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. $\beta = 100011000$

15.2. $\beta = 001011000$

15.3. $\beta = 111011000$

15.4. $\beta = 010111000$

15.5. $\beta = 101111000$

15.6. $\beta = 000000100$

15.7. $\beta = 110000100$

15.8. $\beta = 100000000$

15.9. $\beta = 001000000$

15.10. $\beta = 111000000$

15.11. $\beta = 010100000$

15.12. $\beta = 101100000$

15.13. $\beta = 000010000$

15.14. $\beta = 110010000$

15.15. $\beta = 011010000$

15.16. $\beta = 100110000$

15.17. $\beta = 001110000$

15.18. $\beta = 111110000$

15.19. $\beta = 010001000$

15.20. $\beta = 101001000$

15.21. $\beta = 000101000$

15.22. $\beta = 110101000$

15.23. $\beta = 011101000$

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. $C = \{10100011, 01111110, 00011001, 00100101\}$
16.2. $C = \{10001110, 11000101, 11111101, 01101101\}$
16.3. $C = \{00101000, 10111000, 11110011, 11000011\}$
16.4. $C = \{11001011, 11100100, 00000010, 10000000\}$
16.5. $C = \{00110110, 00011001, 10100111, 10101000\}$
16.6. $C = \{00101101, 00100011, 01011011, 01101000\}$
16.7. $C = \{10001001, 11100010, 01000100, 11000000\}$
16.8. $C = \{00001010, 11010010, 10010000, 10011000\}$
16.9. $C = \{11110100, 01010010, 11101011, 11011011\}$
16.10. $C = \{00011100, 10011100, 01101000, 10100101\}$
16.11. $C = \{10110000, 11011111, 01001011, 00101010\}$
16.12. $C = \{00001001, 01000110, 01101011, 10010000\}$
16.13. $C = \{00110000, 10110000, 01110100, 00110001\}$
16.14. $C = \{00000000, 11100100, 01100010, 00111111\}$
16.15. $C = \{10001110, 00001011, 01100001, 10101010\}$
16.16. $C = \{01110101, 11001011, 00100000, 01001100\}$
16.17. $C = \{11001010, 10110011, 11000101, 01100011\}$
16.18. $C = \{10111011, 00101010, 00111100, 01011110\}$
16.19. $C = \{10001010, 10110000, 00100010, 10100111\}$
16.20. $C = \{11001000, 10001001, 10010100, 01011101\}$
16.21. $C = \{10111100, 10111001, 11100011, 00001000\}$
16.22. $C = \{01100011, 10000110, 01110110, 11101100\}$
16.23. $C = \{11000010, 01110011, 01100011, 11101110\}$
16.24. $C = \{00010111, 01110100, 00010101, 10011100\}$
16.25. $C = \{00100001, 11110010, 11000010, 01111000\}$
16.26. $C = \{11111101, 11111010, 11100100, 11101110\}$
16.27. $C = \{01100001, 11101001, 01101101, 01000010\}$
16.28. $C = \{10110110, 10000000, 10010101, 11101001\}$
16.29. $C = \{00011000, 11110110, 01110111, 00101111\}$
16.30. $C = \{11011001, 10011011, 01001010, 10101011\}$

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

17.1. $x_1 \oplus ((x_2x_3 \to x_3) \sim x_4)$

17.2. $x_1 \mid (\overline{(x_2 \vee x_3) \mid x_4} \downarrow x_3)$

17.3. $((x_1 \vee x_2) \downarrow (x_3 \to x_1)) \to x_4$

17.4. $((x_1 \oplus x_2) \mid x_3) \to (x_4 \to x_2)$

17.5. $x_1 \mid ((x_2 \oplus x_3) \mid (x_4 \mid x_3))$

17.6. $x_1x_2 \oplus ((x_3 \mid x_2) \sim x_4)$

17.7. $(x_1 \to x_1x_2) \mid (x_3 \to x_4)$

17.8. $x_1 \to (x_2x_3 \vee (x_1 \to x_4))$

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

17.10. $((x_1 \to x_2) \vee (x_3 \to x_4))x_4$

17.11. $(x_1 \to x_2) \to \overline{x_2 \downarrow (x_3 \downarrow x_4)}$

17.12. $x_1(x_2 \downarrow x_1) \to \overline{x_3 \vee x_4}$

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

17.14. $x_1x_2(x_3 \vee x_1x_4)$

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

17.16. $\overline{(x_1 \to x_2) \mid x_3} \to (x_2 \downarrow x_4)$

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

17.18. $\overline{x_1 \oplus x_2x_3}(x_2 \mid x_4)$

17.19. $x_1x_2 \oplus \overline{(x_3 \vee x_4) \to x_1}$

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

17.21. $x_1x_2x_3(x_1 \sim x_4)$

17.22. $\overline{x_1 \sim x_2}(x_3 \oplus (x_1 \mid x_4))$

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

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

17.25. $((x_1 \to (x_2 \to x_3)) \downarrow x_4) \to x_2$

17.26. $(x_1x_2 \downarrow x_3) \downarrow (x_1 \sim x_4)$

17.27. $(x_1 \oplus (x_2 \mid x_3)) \to (x_4 \mid x_1)$

17.28. $((x_1 \to x_2) \oplus x_3) \mid \overline{x_3 \downarrow x_4}$

17.29. $(x_1 \downarrow \overline{x_1 \to x_2}) \to (x_3 \downarrow x_4)$

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

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

18.1. $\tilde{\alpha} = 0101001010110101001011$

18.2. $\tilde{\alpha} = 0101010101000110001111$

18.3. $\tilde{\alpha} = 0000010100111011110101$

18.4. $\tilde{\alpha} = 0101000101001111010011$

18.5. $\tilde{\alpha} = 0001110011001001100111$

18.6. $\tilde{\alpha} = 0100001010011011101011$

18.7. $\tilde{\alpha} = 0100110010101010110011$

18.8. $\tilde{\alpha} = 0101000111010100001111$

18.9. $\tilde{\alpha} = 0011010100110011010011$

18.10. $\tilde{\alpha} = 0000000111111011010011$

18.11. $\tilde{\alpha} = 0010110101010001011101$

18.12. $\tilde{\alpha} = 0101010000101101001111$

18.13. $\tilde{\alpha} = 0101001011001100001111$

18.14. $\tilde{\alpha} = 0011010101010101010011$

18.15. $\tilde{\alpha} = 0010001110110100110011$

18.16. $\tilde{\alpha} = 0000010111110100101101$

18.17. $\tilde{\alpha} = 0100110101000011110011$

18.18. $\tilde{\alpha} = 0100000011000110111111$

18.19. $\tilde{\alpha} = 0001100001010001111111$

18.20. $\tilde{\alpha} = 0100000111110100001111$

18.21. $\tilde{\alpha} = 0011010101001100001111$

18.22. $\tilde{\alpha} = 0001011100011101001101$

18.23. $\tilde{\alpha} = 0101010000100011011111$

18.24. $\tilde{\alpha} = 0101000100101000111111$

18.25. $\tilde{\alpha} = 0000000110100111101111$

18.26. $\tilde{\alpha} = 0001011100100100111101$

18.27. $\tilde{\alpha} = 0000110110110101010101$

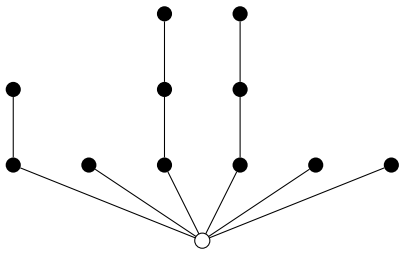
18.28. $\tilde{\alpha} = 0010001010110101010111$

18.29. $\tilde{\alpha} = 0100000100000111111111$

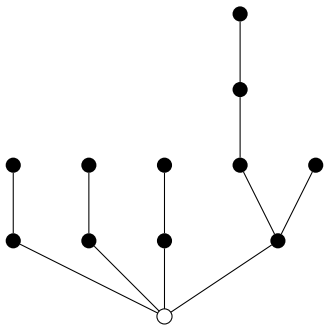
18.30. $\tilde{\alpha} = 0101000011011100001111$

19. Построить код плоского корневого дерева.

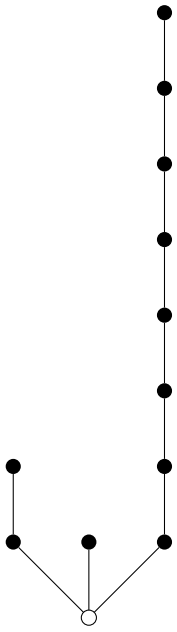
19.1.



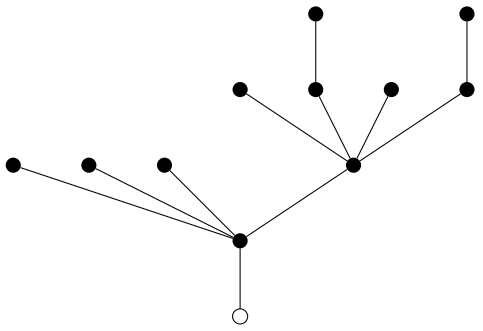
19.2.



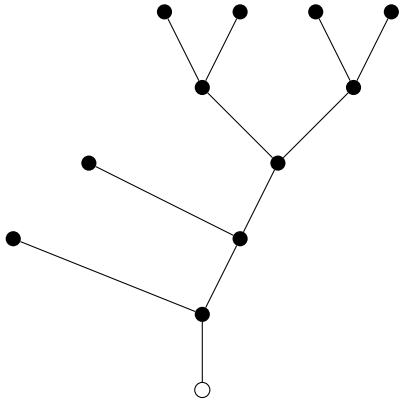
19.3.



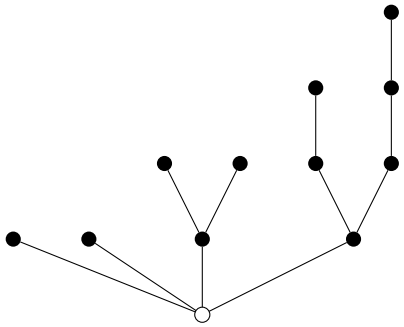
19.4.



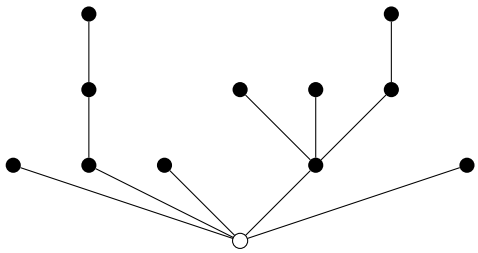
19.5.



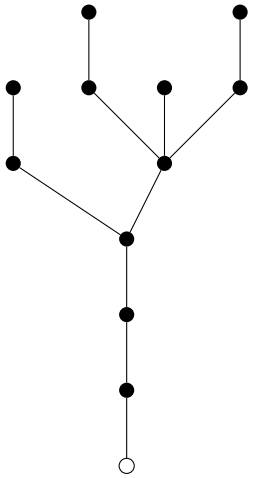
19.6.

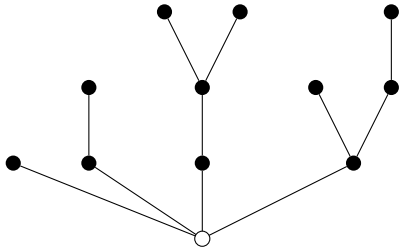


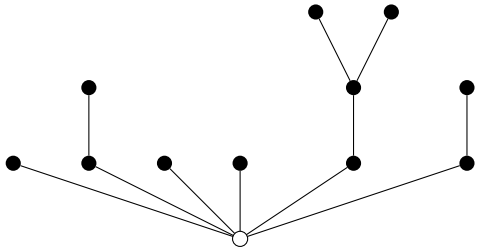
19.7.

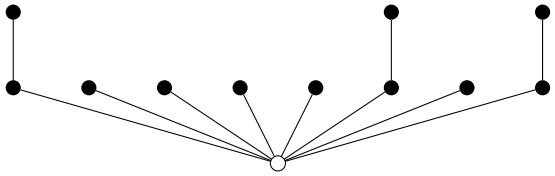


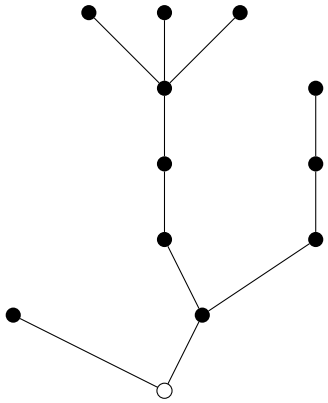
19.8.

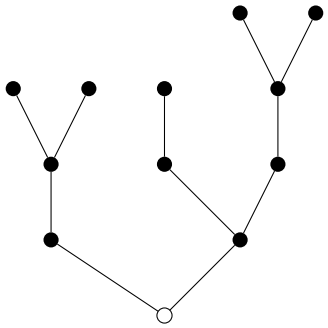


19.9. 

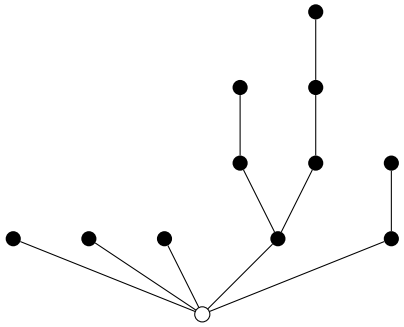
19.10. 

19.11. 

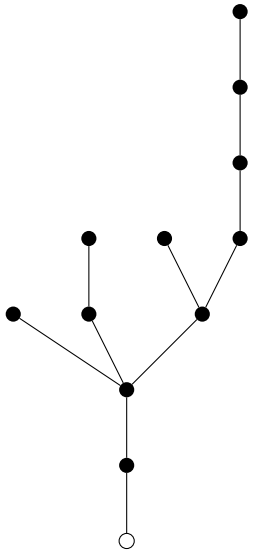
19.12. 

19.13. 

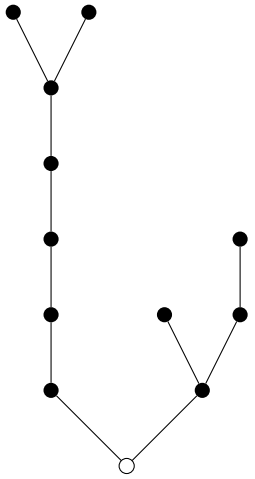
19.14.



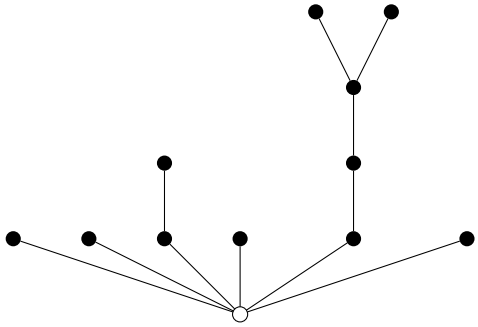
19.15.



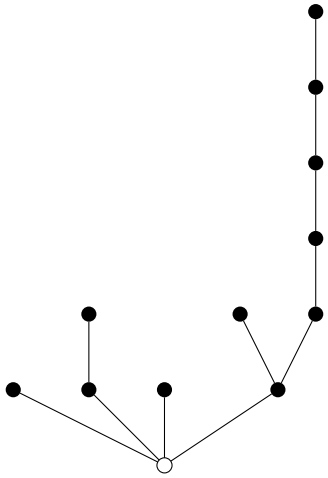
19.16.



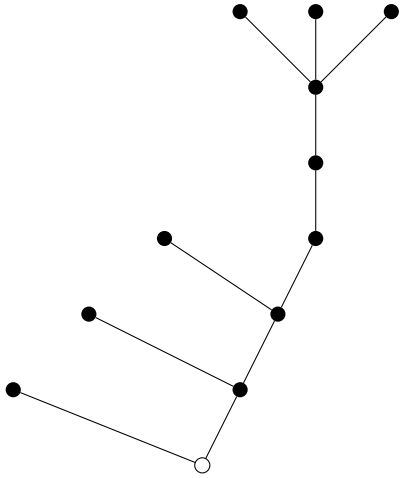
19.17.



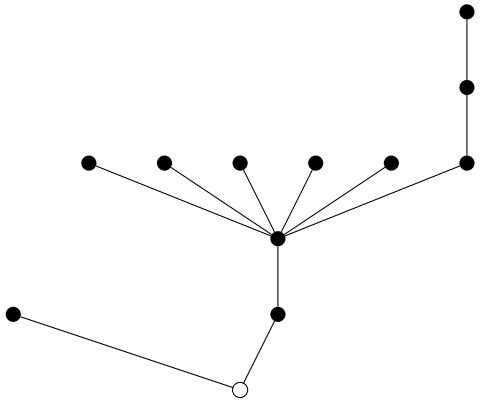
19.18.



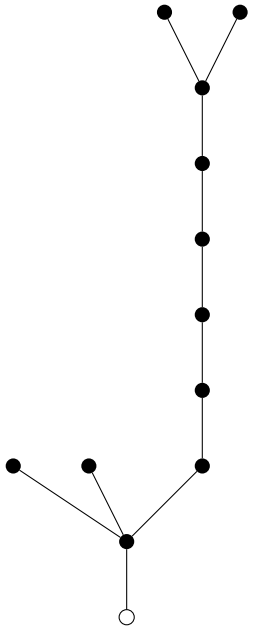
19.19.



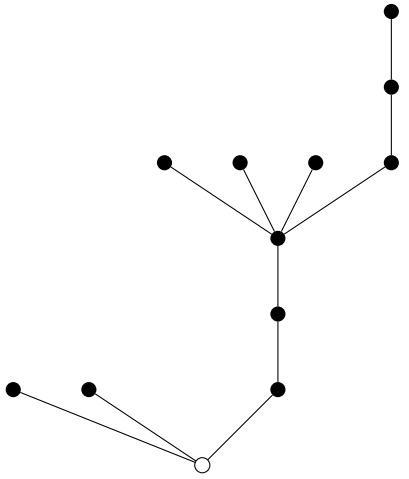
19.20.



19.21.



19.22.



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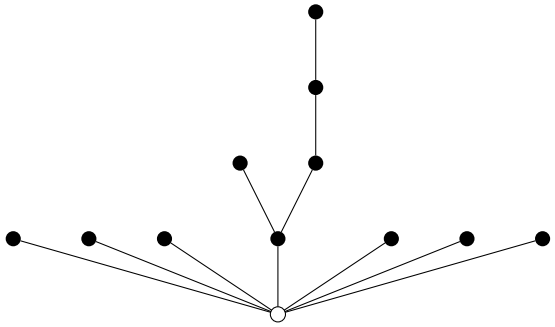

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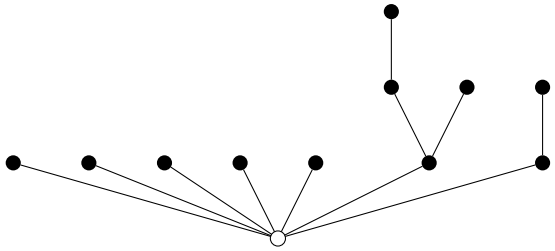

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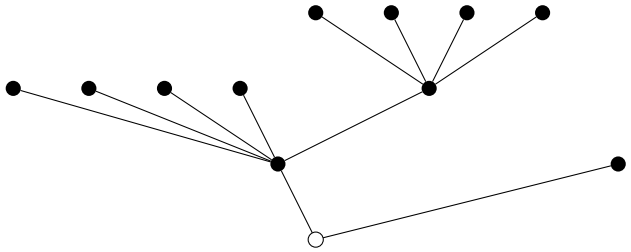

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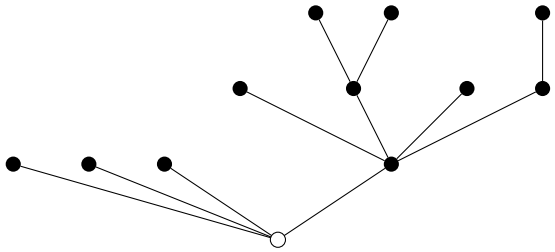

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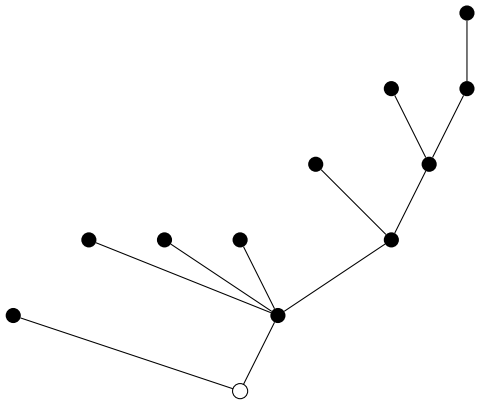

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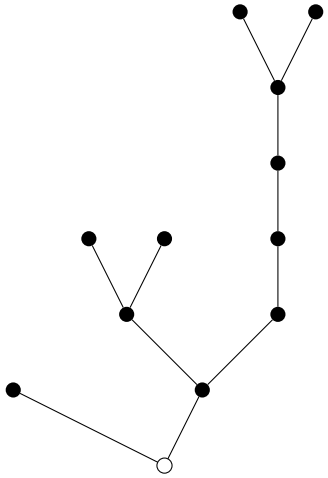

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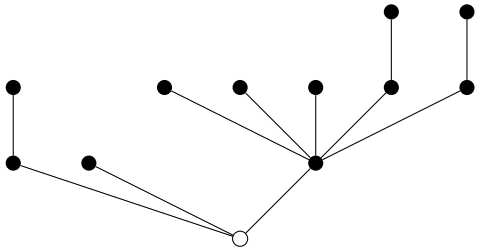

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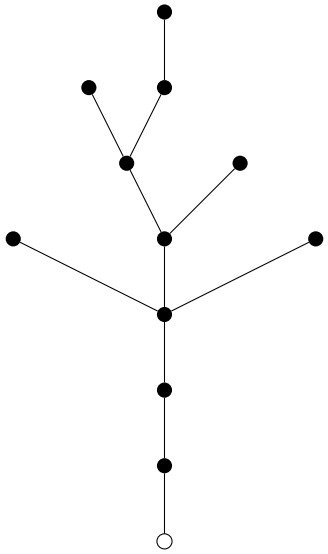

20. По диаграмме расщепления восстановить π-сеть.

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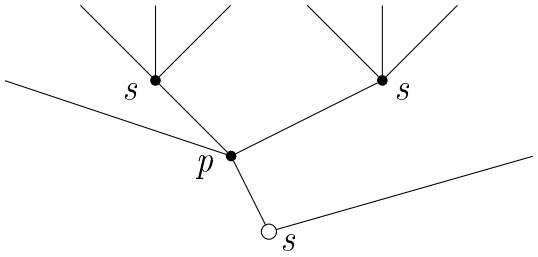

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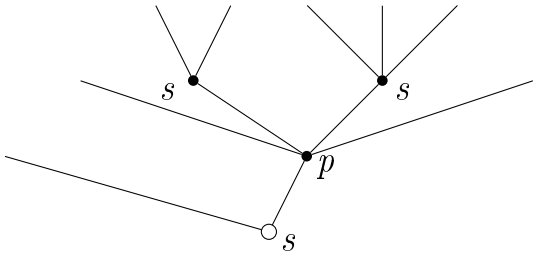

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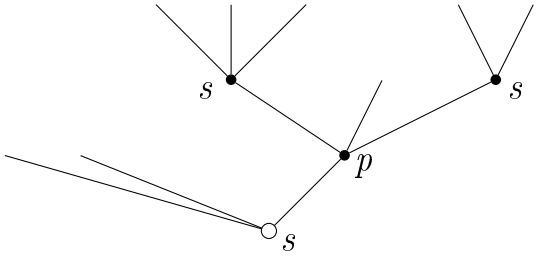

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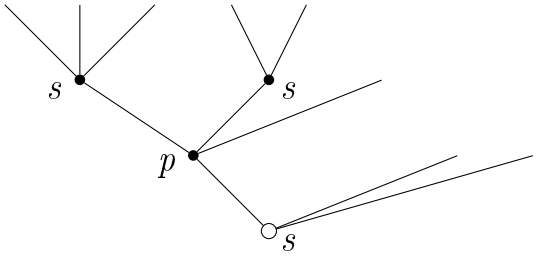

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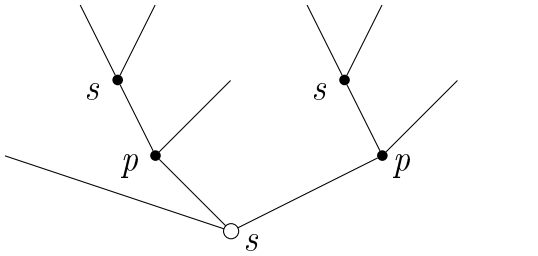
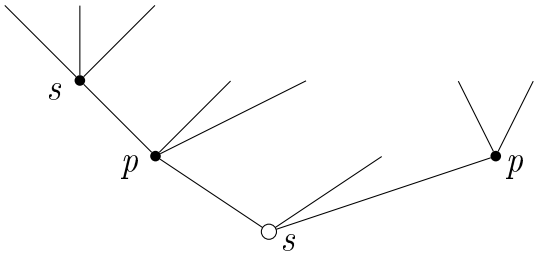
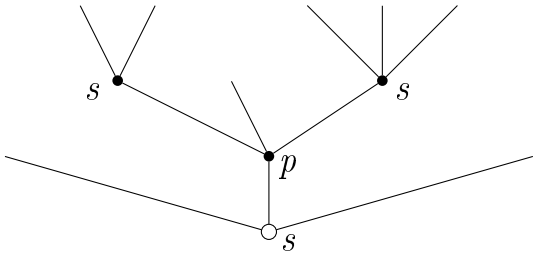
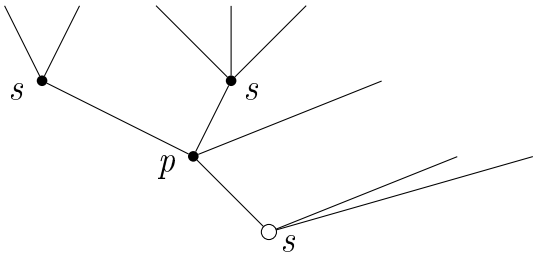
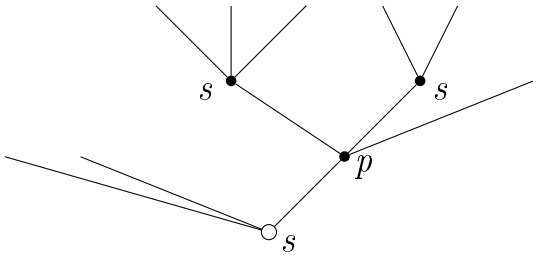
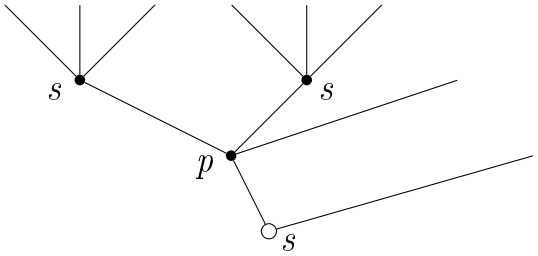


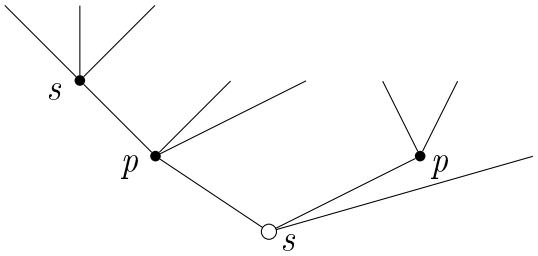
20.6. 

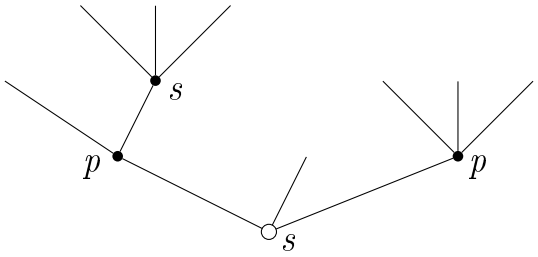
20.7. 

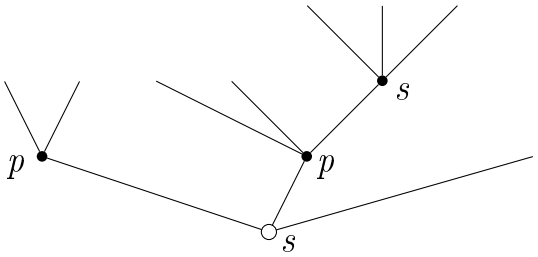
20.8. 

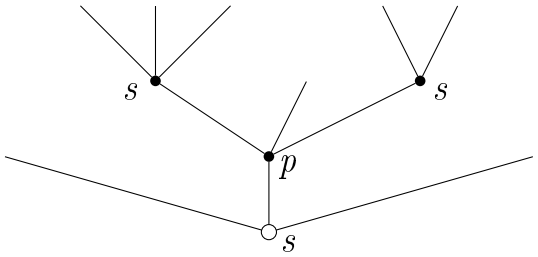
20.9. 

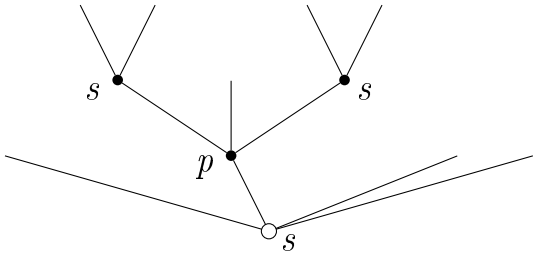
20.10. 

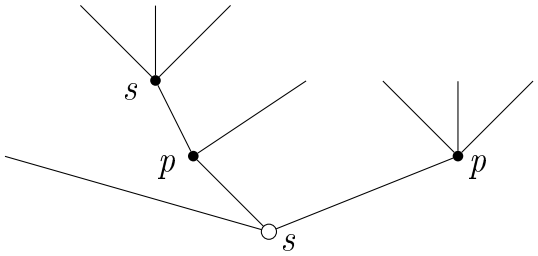
20.11. 

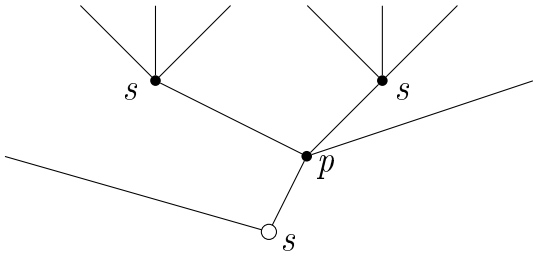
20.12. 

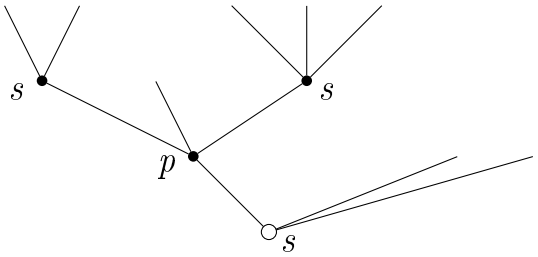
20.13. 

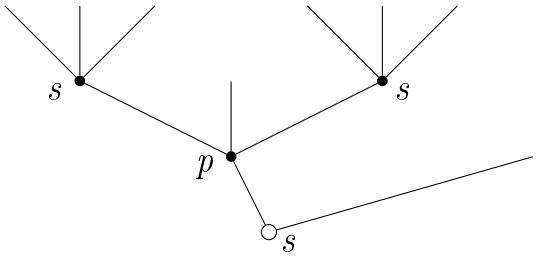
20.14. 

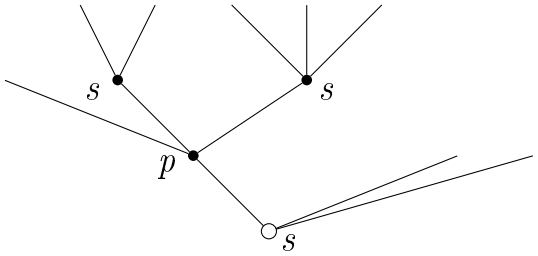
20.15. 

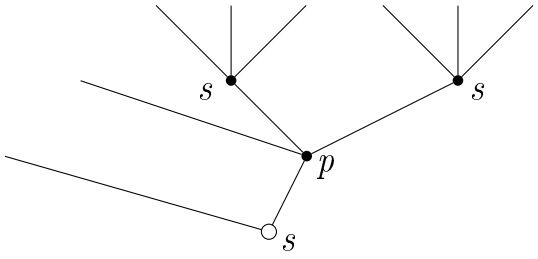
20.16. 

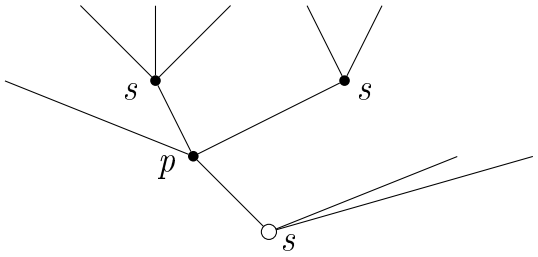
20.17. 

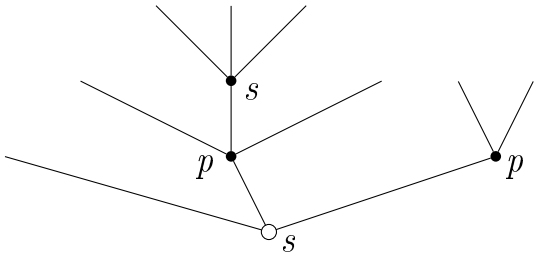
20.18. 

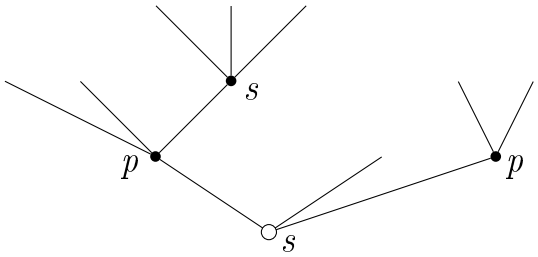
20.19. 

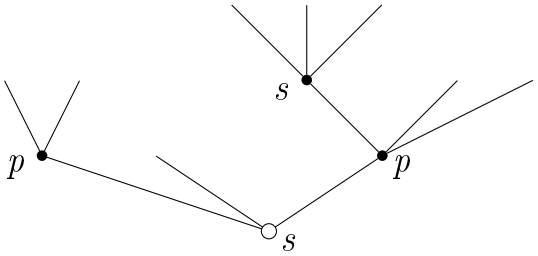
20.20. 

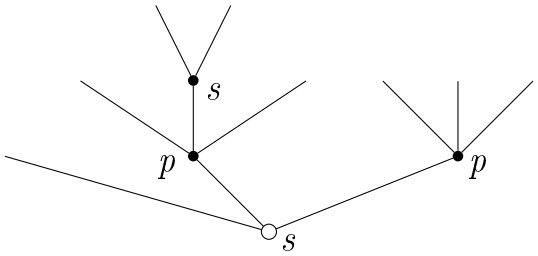
20.21. 

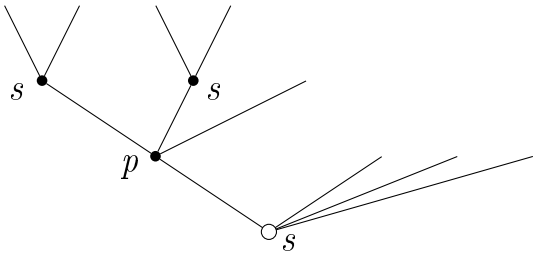
20.22. 

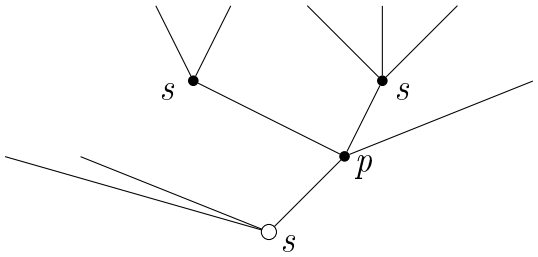
20.23. 

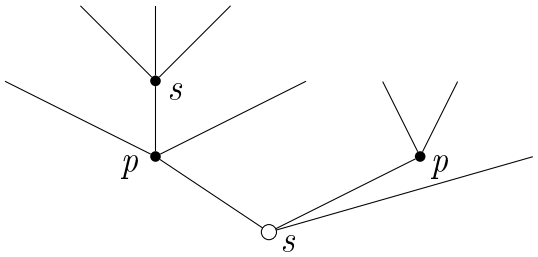
20.24. 

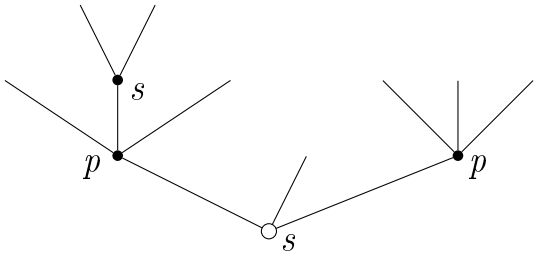
20.25. 

20.26. 

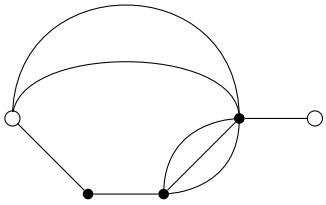
20.27. 

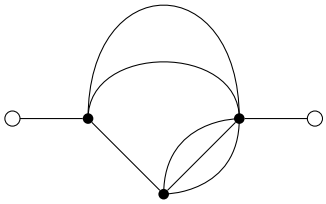
20.28. 

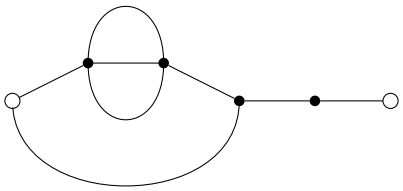
20.29. 

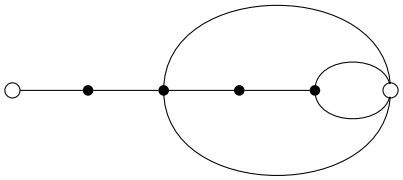
20.30. 

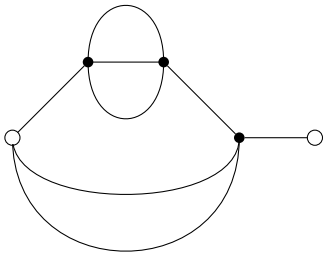
21. Для π-сети построить диаграмму расщепления.

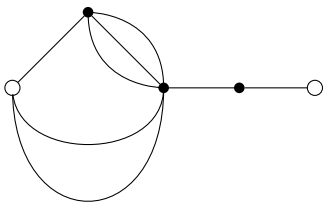
21.1. 

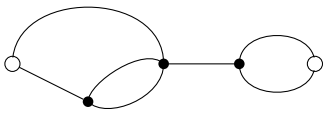
21.2. 

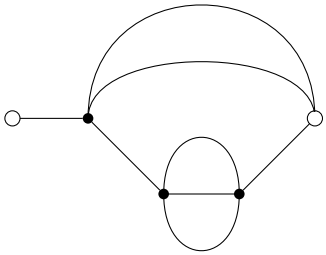
21.3. 

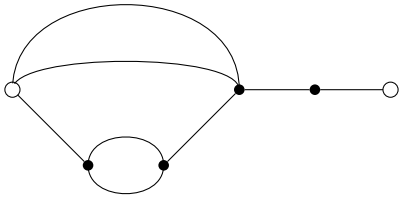
21.4. 

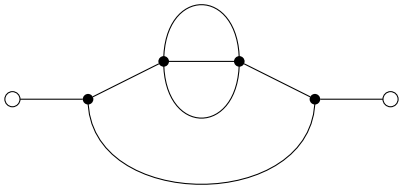
21.5. 

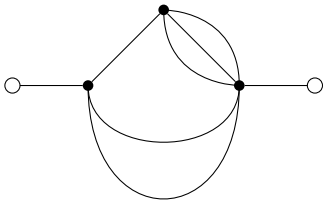
21.6. 

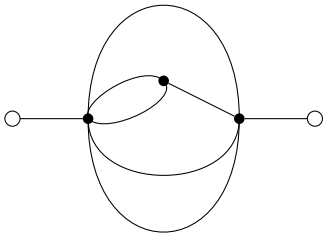
21.7. 

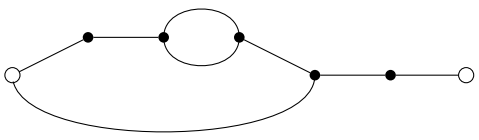
21.8. 

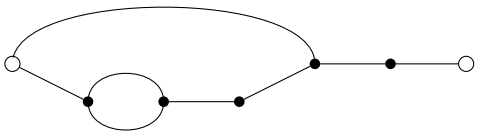
21.9. 

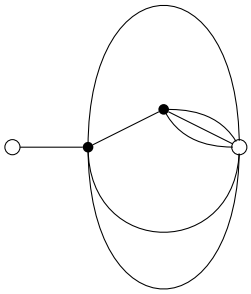
21.10. 

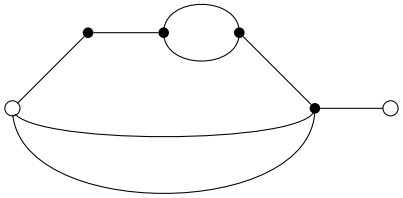
21.11. 

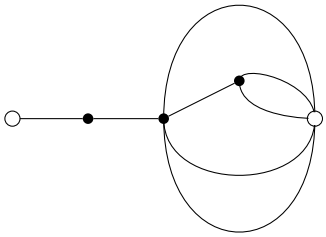
21.12. 

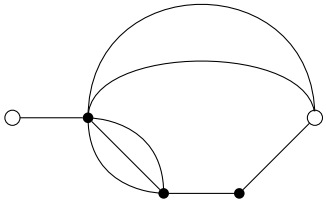
21.13. 

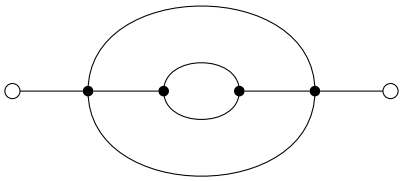
21.14. 

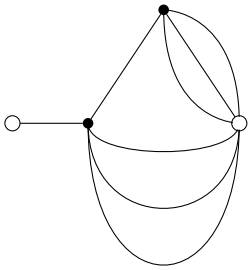
21.15. 

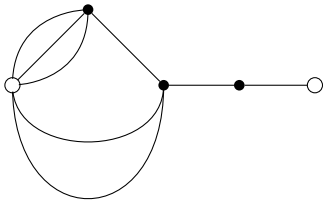
21.16. 

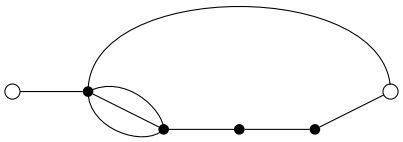
21.17. 

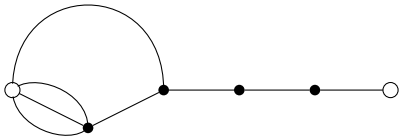
21.18. 

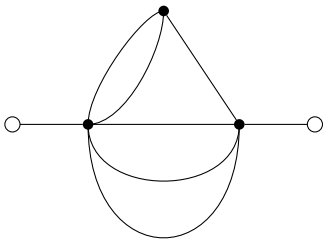
21.19. 

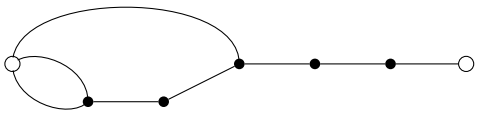
21.20. 

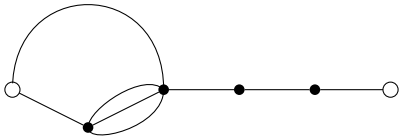
21.21. 

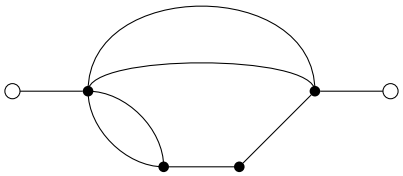
21.22. 

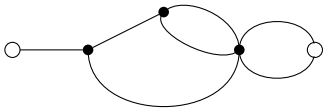
21.23. 

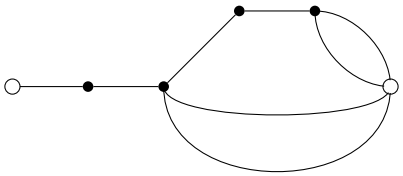
21.24. 

21.25. 

21.26. 

21.27. 

21.28. 

21.29. 

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