Show All Solutions

Rosen, Discrete Mathematics and Its Applications, 8th edition
Extra Examples
Section 13.1—Modeling Computation

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

---

p.852, icon at Example 8
#1. Let $G = (V, T, S, P)$ be a grammar where $V = \{S, A, B, a, b\}$ is the vocabulary and $T = \{a, b\}$ is the set of terminal elements. Determine whether the following set of productions is a:

(i) a type 0 grammar, but not a type 1 grammar.
(ii) a type 1 grammar, but not a type 2 grammar.
(iii) a type 2 grammar, but not a type 3 grammar.

$$S \to ABA, A \to bB, B \to ba.$$

See Solution

---

p.852, icon at Example 8
#2. Let $G = (V, T, S, P)$ be a grammar where $V = \{S, A, B, a, b\}$ is the vocabulary and $T = \{a, b\}$ is the set of terminal elements. Determine whether the following set of productions is a:

(i) a type 0 grammar, but not a type 1 grammar.
(ii) a type 1 grammar, but not a type 2 grammar.
(iii) a type 2 grammar, but not a type 3 grammar.

$$S \to AB, B \to bAa, bAa \to a.$$

See Solution

---

p.855, icon at Example 13
#1.

(a) What is the Backus-Naur form of the grammar described as follows:

1. a sentence is made up of a noun phrase followed by a verb phrase or else by a noun phrase followed by a verb phrase followed by a noun phrase.
2. a noun phrase is made up of a noun, an adjective followed by a noun, or an article followed by a noun.
3. a verb phrase is made up of a verb.
4. articles are *a* and *the*.
5. adjectives are *lengthy*, *boring*, and *inaccurate*.
6. nouns are *book*, *newspaper*, and *information*.
7. verbs are *reads* and *contains*.

(b) Explain how "the newspaper contains lengthy information" can be obtained.

See Solution

---

p.888, icon at Example 3
#1. Let G be the grammar with Vocabulary { S, A, a, b }, set of Terminals T = { a, b }, starting symbol S, and productions P = { S $\rightarrow$ aA, S $\rightarrow$ Aab, A $\rightarrow$ aa, A $\rightarrow$ b }. What is L(G), the language of this grammar?

See Solution

---

p.888, icon at Example 3

#2. Let G be the grammar with Vocabulary { S, A, B, a, b }, set of Terminals T = { a, b }, starting symbol S, and productions P = { S $\rightarrow$ bA, S $\rightarrow$ aB, A $\rightarrow$ ba, B $\rightarrow$ ab }. What is L(G), the language of this grammar?

See Solution

---

p.888, icon at Example 3

#3. Let G be the grammar with Vocabulary { S, A, B, a, b }, set of Terminals T = { a, b }, starting symbol S, and productions P = { S $\rightarrow$ bA, S $\rightarrow$ aB, S $\rightarrow$ AB, A $\rightarrow$ b, B $\rightarrow$ a }. What is L(G), the language of this grammar?

See Solution

Show All Solutions

Rosen, Discrete Mathematics and Its Applications, 8th edition
Extra Examples
Section 13.3—Finite-State Machines with Output

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

---

p.869, icon at Example 6
#1. Construct a deterministic finite-state automaton that recognizes the set of all bit strings such that the first bit is 0 and all remaining bits are 1's.

See Solution

---

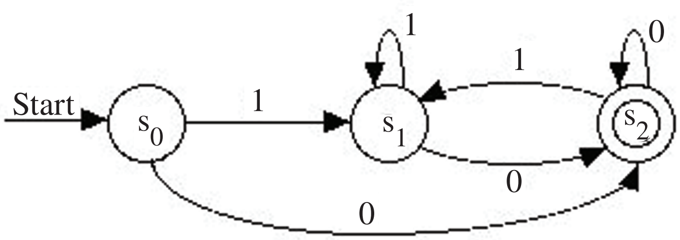
p.869, icon at Example 6
#2. Construct a deterministic finite-state automaton that recognizes the set of all bit strings that contain exactly one 0.

See Solution

---

p.869, icon at Example 6

#3. Determine the set of bit strings recognized by the following deterministic finite-state automaton.

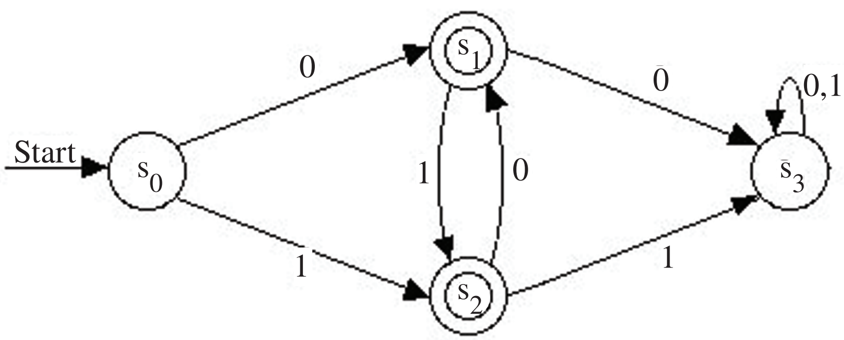


See Solution

---

p.869, icon at Example 6

#4. Determine the set of bit strings recognized by the following deterministic finite-state automaton.

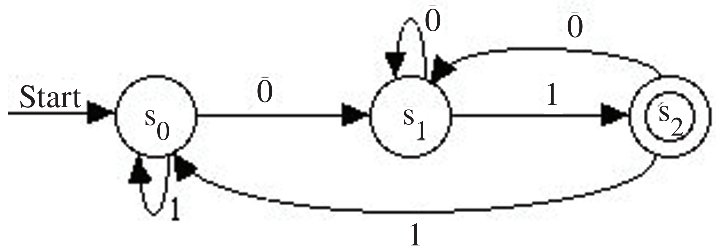


See Solution

---

p.869, icon at Example 6

#5. Determine the set of bit strings recognized by the following deterministic finite-state automaton.



See Solution

Show All Solutions

Rosen, Discrete Mathematics and Its Applications, 8th edition
Extra Examples
Section 13.5—Turing Machines

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

---

p.889, icon at Example 1
#1. Let T be the Turing machine defined by these five-tuples:

$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

If T is run on the following tape, beginning in initial position, what is the final tape when T halts?

···	B	B	0	1	B	1	1	B	B	···

See Solution

---

p.889, icon at Example 1
#2. Let T be the Turing machine defined by these five-tuples:

$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

If T is run on the following tape, beginning in initial position, what is the final tape when T halts?

···	B	B	1	B	0	1	0	B	B	···

See Solution

---

p.889, icon at Example 1
#3. Let T be the Turing machine defined by these five-tuples:

$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

If T is run on the following tape, beginning in initial position, what is the final tape when T halts?

⋯	B	B	0	0	0	1	0	B	B	⋯

See Solution

---

p.889, icon at Example 1

#4. Let T be the Turing machine defined by these five-tuples:

$$(s_0, 0, s_1, 1, R), (s_0, 1, s_0, 0, R), (s_0, B, s_1, 0, R), (s_1, 0, s_0, 0, R), (s_1, 1, s_2, 0, R), (s_1, B, s_2, 1, L).$$

If T is run on the following tape, beginning with the third blank from the left, what is the final tape when T halts?

⋯	B	B	B	B	B	B	B	B	B	⋯

See Solution