BRAC UNIVERSITY

Merul Badda, Dhaka, Bangladesh

CSE331 : Automata and Computability

Assignment 3

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1. Use the pumping lemma to show that the following languages are not regular:

A. L(M) → $\{0^{2n}1^{n} \mid n \geq 0\}$, where Σ = {0, 1}.

See example 4 of the provided video resource on the Pumping Lemma for RL.

B. L(M) → $\{0^{n}1^{m}0^{f(n,m)} \mid n, m \geq 0\}$, where $f(n, m) = n * m$ and Σ = {0, 1}.

See example 7 of the provided video resource on the Pumping Lemma for RL.

C. L(M) → $\{0^{n}1^{m} \mid n > m\}$, where Σ = {0, 1}.

See example 3 of the provided video resource on the Pumping Lemma for RL.

D. L(M) → $\{0^{n^2} \mid n \geq 0\}$, where Σ = {0, 1}.

See example 10 of the provided video resource on the Pumping Lemma for RL.

E. L(M) → $\{w\ is\ not\ a\ palindrome\}$, where Σ = {0, 1}.

See example 18 of the provided video resource on the Pumping Lemma for RL.

2. Write a CFG for the following CFL:

A. $L(M) \rightarrow \{0^{n}1^{m} \mid n, m \geq 0\ and\ 2n = 3m\},\ where\ \Sigma = \{0, 1\}$

S → 000S11 | ε

B. $L(M) \rightarrow \{0^{n}1^{m}2^{m}3^{n} \mid n, m > 0\},\ where\ \Sigma = \{0, 1, 2, 3\}$

S → 0S3 | A | ε

A → 1A2 | ε

C. $L(M) \rightarrow \{w = 0^{i}1^{j}2^{k} \mid i, j, k \geq 0\ and\ j < i + k\},\ where\ \Sigma = \{0, 1, 2\}$

S → XABY | XA | BY

A → 0A1 | ε

B → 1B2 | ε

X → 0X | 0

Y → 2Y | 2

D. $L(M) \rightarrow \{w_1\#w_2 \mid the\ number\ of\ 00\ in\ w_1\ is\ equal\ to\ the\ number\ of\ 11\ in\ w_2\},\ where\ \Sigma = \{0, 1\}$

S → 0B1 | XS | SY | Z

X → 1X | 01X | ε

Y → 0Y | 01Y | ε

Z → 0# | #1 | 0#1 | #

A → 0B | 1A

B → 0D | 1A

C → D1 | C0

D → E1 | 0C

E → B | #

E. $L(M) \rightarrow \{w\#x \mid w^{R}\ is\ a\ substring\ of\ x\},\ where\ \Sigma = \{0, 1\}$

S → AB

A → 0A0 | 1A1 | #B

B → 0B | 1B | ε