**1.**

답: $(0+1)^*01101$

$$\begin{cases} A = 0B + 1A \\ B = 0B + 1C \\ C = 0B + 1D \\ D = 0E + 1A \\ E = 0B + 1F \\ F = 0B + 1D + \varepsilon \end{cases}$$

$F = C + \varepsilon$

$E = 0B + 1C + 1 = B + 1$

D = 0B+1A + 01 = A+ 01

C = 0B + 1A + 101 = A +101

B = 0B+ 1A + 1101 = A + 1101

A = 0A + 1A + 01101

= (0+1)A + 01101

= $(0+1)^*01101$

## 2.

**Theorem 3.4**
**If L = L(D) for some DFA D, then there is a regular expressions R such that L = L(R).**

$$R_{ij}^{k} = R_{ik}^{k-1} (R_{kk}^{k-1})^{*} R_{kj}^{k-1} + R_{ij}^{k-1}$$

구하고자 하는 정규 표현은 $R_{11}^{4}$ 이므로, 필요한 식만 구하도록 한다.

$R_{ij}^{k}$

K=0

| i \ j | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | ε+b | ϕ | a | ϕ |
| 2 | a | ε | b | ϕ |
| 3 | ϕ | a | ε | b |
| 4 | ϕ | b | ϕ | ε+a |

K=1

| i \ j | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | $b^*$ | ϕ | $b^*$a | ϕ |
| 2 | a$b^*$ | ε | b + a$b^*a$ | ϕ |
| 3 | ϕ | a | ε | b |
| 4 | ϕ | b | ϕ | ε+a |

K=2

| i \ j | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | $b^*$ | | $b^*$a | ϕ |
| 2 | | | | |
| 3 | aa$b^*$ | | ε+ab + aa$b^*a$ | b |
| 4 | ba$b^*$ | | bb+ ba$b^*a$ | ε+a |

K=3

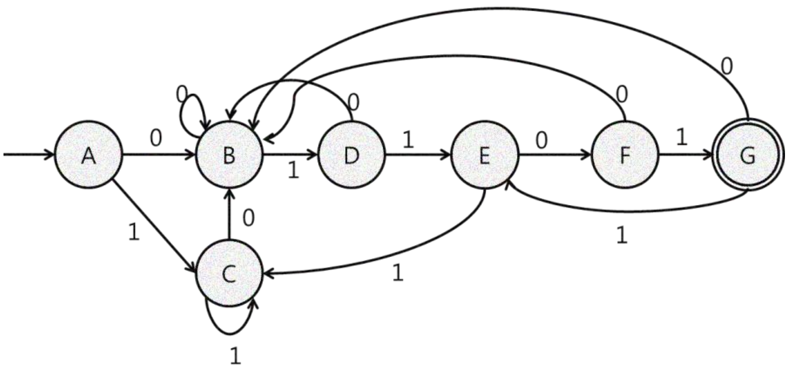
| i \ j | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | $b^* + b^*a(ab + aab^*a)^*aab^*$ | | | $b^*a(ab + aab^*a)^*$b |
| 2 | | | | |
| 3 | | | | |
| 4 | ba$b^*$ + $(bb + bab^*a)\ (ab + aab^*a)^*aab^*$ | | | ε+$a + (bb + bab^*a)\ (ab + aab^*a)^*b$ |

$R_{11}^{4} = R_{11}^{3} + R_{14}^{3}(R_{44}^{3})^{*}R_{41}^{3}$

$\therefore\ R_{11}^{4} =$

$b^* + b^*a(ab + aab^*a)^*aab^*+$
$b^*a(ab + aab^*a)^*$b $(a + (bb + bab^*a)\ (ab + aab^*a)^*b)^*($ ba$b^*$ $+ (bb + bab^*a)(ab + aab^*a)^*aab^*)$

**3.**




Initial state : A,    Final state : G

| $2^Q$ | $\Sigma$ | 0 | 1 |
|---|---|---|---|
| A | $\varepsilon^*(\{1\})$ $=\{1,2,3,4,8\}$ | $\varepsilon^*(\{5,9\})$ | $\varepsilon^*(\{6\})$ |
| B | $\varepsilon^*(\{5,9\})$ $=\{2,3,4,5,7,8,9\}$ | $\varepsilon^*(\{5,9\})$ | $\varepsilon^*(\{6,10\})$ |
| C | $\varepsilon^*(\{6\})$ $=\{2,3,4,6,7,8\}$ | $\varepsilon^*(\{5,9\})$ | $\varepsilon^*(\{6\})$ |
| D | $\varepsilon^*(\{6,10\})$ $=\{2,3,4,6,7,8,10\}$ | $\varepsilon^*(\{5,9\})$ | $\varepsilon^*(\{6,11\})$ |
| E | $\varepsilon^*(\{6,11\})$ $=\{2,3,4,6,7,8,11\}$ | $\varepsilon^*(\{5,9,12\})$ | $\varepsilon^*(\{6\})$ |
| F | $\varepsilon^*(\{5,9,12\})$ $=\{2,3,4,5,7,8,9,12\}$ | $\varepsilon^*(\{5,9\})$ | $\varepsilon^*(\{6,10,13\})$ |
| G | $\varepsilon^*(\{6,10,13\})$ $=\{2,3,4,6,7,8,10,13\}$ | $\varepsilon^*(\{5,9\})$ | $\varepsilon^*(\{6,11\})$ |