Reg&Lab HW5.

2.

(a) $y_{1j} = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \varepsilon_{1j}$

$= \beta_0 + \beta_1 + \varepsilon_{1j}$

$y_{2j} = \beta_0 + \beta_2 + \varepsilon_{2j}$

$y_{3j} = \beta_0 - \beta_1 - \beta_2 + \varepsilon_{3j}$

$E(y_{1j}) = \mu_1 = \beta_0 + \beta_1$

$E(y_{2j}) = \mu_2 = \beta_0 + \beta_2$

$E(y_{3j}) = \mu_3 = \beta_0 - \beta_1 - \beta_2$

$\Leftrightarrow \frac{\mu_1+\mu_2+\mu_3}{3} = \beta_0,\ \beta_1 = \mu_1 - \beta_0 = \mu_1 - \frac{\mu_1+\mu_2+\mu_3}{3},$

$\beta_2 = \mu_2 - \beta_0 = \mu_2 - \frac{\mu_1+\mu_2+\mu_3}{3}$

(b) $$\mathbb{Y} = \begin{pmatrix} \mathbb{Y}_1 \\ \mathbb{Y}_2 \\ \mathbb{Y}_3 \end{pmatrix} = \begin{pmatrix} y_{11} \\ \vdots \\ y_{1n} \\ y_{21} \\ \vdots \\ y_{2n} \\ y_{31} \\ \vdots \\ y_{3n} \end{pmatrix}$$

$$X = \begin{pmatrix} 1 & 1 & 0 \\ & \vdots & \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ & \vdots & \\ 1 & 0 & 1 \\ 1 & -1 & -1 \\ & \vdots & \\ 1 & -1 & -1 \end{pmatrix} \begin{array}{l} \left.\vphantom{\begin{matrix}1\\ \vdots \\ 1\end{matrix}}\right\} n\text{개} \\ \left.\vphantom{\begin{matrix}1\\ \vdots \\ 1\end{matrix}}\right\} n\text{개} \\ \left.\vphantom{\begin{matrix}1\\ \vdots \\ 1\end{matrix}}\right\} n\text{개} \end{array}$$