1. 当$k=2$时，

$$\begin{aligned}\mathcal{B}_2=\{&\underbrace{\{s_1,s_2\},\cdots,\{s_1,s_2\}}_{t个},\underbrace{\{s_1,s_2\},\cdots,\{s_1,s_2\}}_{t个},\cdots\underbrace{\{s_1,s_v\},\cdots,\{s_1,s_v\}}_{t个},\\&\underbrace{\{s_2,s_3\},\cdots,\{s_2,s_3\}}_{t个},\cdots,\underbrace{\{s_2,s_v\},\cdots,\{s_2,s_v\}}_{t个},\\&\vdots\\&\underbrace{\{s_{v-1},s_v\},\cdots,\{s_{v-1},s_v\}}_{t个}\}\end{aligned}$$

所以$b=\frac{v(v-1)}{2}t$，$v=v$，$r=vt$，$\lambda=t$。

当$k=v-2$时，

$$\begin{aligned}\mathcal{B}_{v-2}=&\\\{&\underbrace{S-\{s_1,s_2\},\cdots,S-\{s_1,s_2\}}_{t个},\underbrace{S-\{s_1,s_2\},\cdots,S-\{s_1,s_2\}}_{t个},\cdots\underbrace{S-\{s_1,s_v\},\cdots,S-\{s_1,s_v\}}_{t个},\\&\underbrace{S-\{s_2,s_3\},\cdots,S-\{s_2,s_3\}}_{t个},\cdots,\underbrace{S-\{s_2,s_v\},\cdots,S-\{s_2,s_v\}}_{t个},\\&\vdots\\&\underbrace{S-\{s_{v-1},s_v\},\cdots,S-\{s_{v-1},s_v\}}_{t个}\}\end{aligned}$$

所以$b=\frac{v(v-1)}{2}t$，$v=v$，$r=\frac{(v-1)(v-2)}{2}t$，$\lambda=\frac{(v-2)(v-3)}{2}t$。

10. (3)　(12,9,4,3,1)-BIBD。

11. $A=\begin{bmatrix}1&1&1&0\\0&1&1&1\\1&0&1&1\\1&1&0&1\end{bmatrix},A^T=\begin{bmatrix}1&0&1&1\\1&1&0&1\\1&1&1&0\\0&1&1&1\end{bmatrix}.$

$$AA^T=\begin{bmatrix}3&2&2&2\\2&3&2&2\\2&2&3&2\\2&2&2&3\end{bmatrix}.$$