Questions on Small Area Estimation module

1. In the small area literature, what is a direct estimator?
	1. An estimator obtained assuming that the design is simple random sample FALSE
	2. An estimator obtained by using the whole sample data, not only area specific data FALSE
	3. An estimator based on survey weights FALSE
	4. An estimator obtained using only area-specific data TRUE
2. What is a small area?
	1. It is an area where the sample size is small FALSE
	2. It is a geographical area that is small if compared to other areas FALSE
	3. It is an area for which direct estimators are biased FALSE
	4. It is an area for which direct estimators do not reach a minimum level of precision TRUE
3. What of the following is *not* an advantage of a synthetic estimator?
	1. Applies to general sampling designs FALSE
	2. Borrow strength from similar FALSE
	3. Provides estimates for areas with no sample from the sample survey FALSE
	4. It is design-unbiased TRUE
4. A composite estimator aims to
	1. balance the potential bias of a synthetic estimator against the instability (high variance) of a design-based estimator TRUE
	2. reduce or remove the potential bias of a synthetic estimator FALSE
	3. reduce the instability (high variance) of a design-based estimator FALSE
	4. balance the potential bias of a design-based estimator against the instability (high variance) of a synthetic estimator FALSE
5. Let $ϕ\_{i}\in [0,1]$, $\hat{Y}\_{i,D}$ be a direct estimator and $\hat{Y}\_{i,S}$ be a synthetic estimator, where $i$ indices the area. Which of the following is a composite estimator?
	1. $ϕ\_{i}\hat{Y}\_{i,S}+\left(1-ϕ\_{i}\right)\hat{Y}\_{i,D}$ TRUE
	2. $\hat{Y}\_{i,S}+\hat{Y}\_{i,D}$ FALSE
	3. $\frac{ϕ\_{i}\hat{Y}\_{i,S}}{\left(1-ϕ\_{i}\right)\hat{Y}\_{i,D}}$ FALSE
	4. $\hat{Y}\_{i,S}+ϕ\_{i}\hat{Y}\_{i,D}$ FALSE
6. When area-level SAE model should be used?
	1. when unit-level data are unavailable, or when model covariates are only available in aggregate form TRUE
	2. when unit-level data are available FALSE
	3. when survey data are available, and the average values of the auxiliary variables are available at area level FALSE
	4. when survey data are available FALSE
7. A spatial area-level SAE model is defined
	1. by autoregressive spatially correlated area random effects TRUE
	2. by autoregressive spatially correlated sampling errors FALSE
	3. by measuring the spatial correlation among the direct estimates FALSE
	4. neither of the previous three FALSE
8. The EBLUP is
	1. a design-based estimator FALSE
	2. a model-based estimator TRUE
	3. an assisted based estimator FALSE
	4. neither of the previous three FALSE
9. In the basic unit-level small area model $y\_{ij}=x\_{ij}^{T}β+u\_{i}+e\_{ij}$, the assumptions on $u\_{i}$ and $e\_{ij}$ are:
	1. $u\_{i}∼N\left(0,σ\_{u}^{2}\right),e\_{ij}∼N\left(0,σ\_{e}^{2}\right), u\_{i}⊥e\_{ij}∀i,j$ TRUE
	2. $u\_{i}∼N\left(0,ψ\_{i}\right),e\_{ij}∼N\left(0,σ\_{e}^{2}\right), u\_{i}⊥e\_{ij}∀i,j$ FALSE
	3. $u\_{i}∼N\left(0,σ\_{u}^{2}\right),e\_{ij}∼N\left(0,ψ\_{i}\right), u\_{i}⊥e\_{ij}∀i,j$ FALSE
	4. $u\_{i}∼N\left(0,σ\_{u}^{2}\right),e\_{ij}∼N\left(0,σ\_{e}^{2}\right)$ FALSE
10. The EBLUP of $θ\_{i}$ under the unit-level approach is
	1. $\hat{θ}^{EBLUP}\_{i}=N\_{i}^{-1}\left\{\sum\_{j\in s\_{i}}^{}y\_{ij}+\sum\_{k\in r\_{i}}^{}(x\_{ik}^{T}\hat{β}+\hat{u}\_{i})\right\}$ TRUE
	2. $\hat{θ}^{EBLUP}\_{i}=N\_{i}^{-1}\left\{\sum\_{j\in s\_{i}}^{}y\_{ij}+\sum\_{k\in r\_{i}}^{}(x\_{ik}^{T}\hat{β})\right\}$ FALSE
	3. $\hat{θ}^{EBLUP}\_{i}=N\_{i}^{-1}\left\{\sum\_{j\in s\_{i}}^{}y\_{ij}+\sum\_{k\in r\_{i}}^{}(x\_{ik}^{T}β+u\_{i})\right\}$ FALSE
	4. $\hat{θ}^{EBLUP}\_{i}=N\_{i}^{-1}\left\{\sum\_{j\in s\_{i}}^{}y\_{ij}+\sum\_{k\in s\_{i}}^{}(x\_{ik}^{T}\hat{β}+\hat{u}\_{i})\right\}$ FLASE