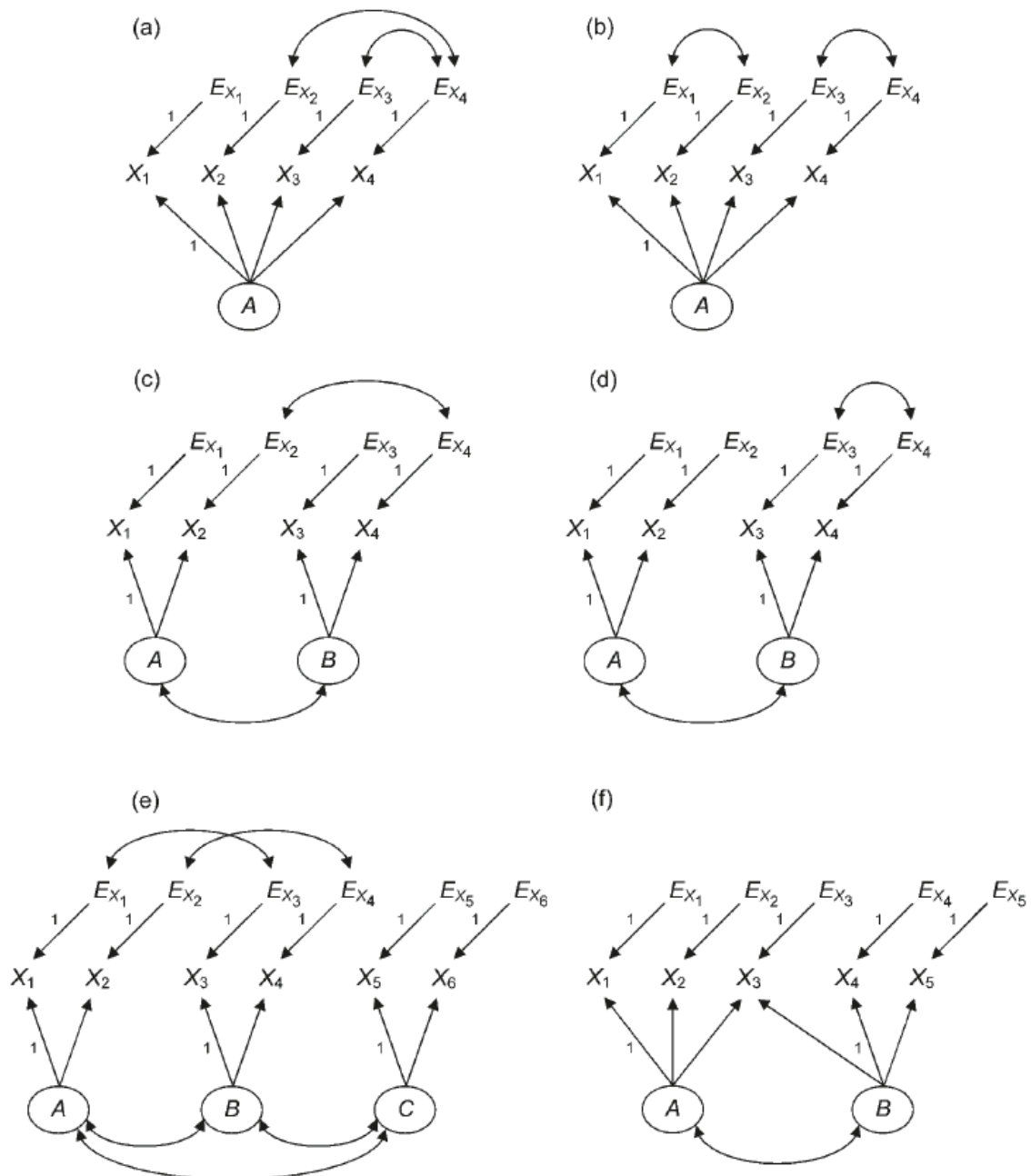## Practical 6

For each of the following models:

1) Apply the T-Rule and determine the degrees of freedom of the model
2) Apply the identification heuristics rules (see other page) to determine if the model is theoretically identified.

TABLE 6.1. Identification Rule 6.6 for Nonstandard Confirmatory Factor Analysis Models with Measurement Errors

For a nonstandard CFA model with measurement error correlations to be identified, all three of the conditions listed next must hold:	(Rule 6.6)

For each factor, at least one of the following must hold: (Rule 6.6a)

1. There are at least three indicators whose errors are uncorrelated with each other.
2. There are at least two indicators whose errors are uncorrelated and either
   a. the errors of both indicators are not correlated with the error term of a third indicator for a different factor, or
   b. an equality constraint is imposed on the loadings of the two indicators.

For every pair of factors, there are at least two indicators, one from each factor, whose error terms are uncorrelated. (Rule 6.6b)

For every indicator, there is at least one other indicator (not necessarily of the same factor) with which its error term is not correlated. (Rule 6.6c)

Note. These requirements are described as Conditions B–D in Kenny, Kashy, and Bolger (1998, pp. 253–254).

TABLE 6.2. Identification Rule 6.7 for Multiple Loadings of Complex Indicators in Nonstandard Confirmatory Factor Analysis Models and Rule 6.8 for Error Correlations of Complex Indicators

Factor loadings

For every complex indicator in a nonstandard CFA model: (Rule 6.7)

In order for the *multiple factor loadings* to be identified, both of the following must hold:

1. *Each factor on which the complex indicator loads* must satisfy Rule 6.6a for a minimum number of indicators.
2. *Every pair of those factors* must satisfy Rule 6.6b that each factor has an indicator that does not have an error correlation with a corresponding indicator on the other factor of that pair.

Error correlations

In order for *error correlations* that involve complex indicators to be identified, both of the following must hold: (Rule 6.8)

1. Rule 6.7 is satisfied.
2. For each factor on which a complex indicator loads, there must be at least one indicator with a single loading that does not have an error correlation with the complex indicator.

Note. These requirements are described as Condition E in Kenny, Kashy, and Bolger (1998, p. 254).

Source: Kline (2016)