Exercise 1

Rules of the Multiple Group-method (MGM):

A. Items must have high (corrected) correlation with the scale (> 0.3) (convergence, alpha if item deleted, corrected item total correlation).

B. Items must have higher correlation with own scale than with other scales (divergence).

C. Items must have higher correlations with own scale than the correlation between the scales.

Ad A.

All items have correlation > 0.3 with their own scale.
Item CC5 has alpha if item deleted > alpha. Item – rest of the scale correlation is also much smaller than those of other items of the scale CC.
→ CC5 does not satisfy the criteria.

Ad B.

Items CO9, CS9, CV2, CC1 and CC9 are not divergent → does not satisfy the criteria.

Ad C.

The highest correlation of the scale CO with other scales is 0.72 (CS). Thus, items of this scale must have higher correlation with this scale than this value. This is only true for items CO1 and CO10.
→ Other 10 items does not satisfy the criteria.

The highest correlation of the scale CD with other scales is 0.66 (CO). Thus, items of this scale must have higher correlation with this scale than this value. This is only true for items CD4, CD6, CD10 and CD12.
→ 8 items does not satisfy the criteria.

The highest correlation of the scale CS with other scales is 0.72 (CO). Thus, items of this scale must have higher correlation with this scale than this value. This is only true for items CS2, CS5, CS6, Cs8 and CS11.
→ 7 items does not satisfy the criteria.

The highest correlation of the scale CV with other scales is 0.65 (CS). Thus, items of this scale must have higher correlation with this scale than this value. This is only true for items CV6, CV9, CV10 and CV12.
→ 8 items does not satisfy the criteria.

The highest correlation of the scale CC with other scales is 0.67 (CO). Thus, items of this scale must have higher correlation with this scale than this value. This is only true for items CC3, CC4, CC6, CC7, CC10 and CC12.
→ 6 items does not satisfy the criteria.

Final conclusions:

In respect to criteria A and B, we can speak of reasonably good scales results, which in most part match the expectations of the researchers.

However, the scales are clearly not complying with the criterion C. The violations of this criterion indicate that the five concepts are highly correlated, so much so that we cannot simply speak of five separate sub-concepts.

You might ask whether the distinction in five separate terms makes sense. Maybe you can suffice with less than five separate concepts.

Exercise 2

a. $J(J+1)/2 = (6 * 7)/2 = 21$

b. $2J = 12$

c. df = # elem. cov.- # parameters
df = 21-12 = 9

d. The probability level of chi-square = 0.000 < 0.05, therefore the null hypothesis is rejected. The null hypothesis states: the 1 factor model fits perfect. Thus the 1 factor model is rejected.

e. RMSEA = 0.108

rules of thumb of RMSEA:
RMSEA < 0.05 → model fits good
0.05<RMSEA<0.08 → model fits acceptable/sufficient

RMSEA > 0.08 → model fits bad

RMSEA is 0.108 > 0.08 so model fits bad.

To determine fit, the null hypothesis is:

f. H0: model fits good
H0: RMSEA < 0,05

PCLOSE < 0,05, thus the null hypothesis of good fit is rejected

g. Covariances between item 116 and 117 and between item 116 and 114.

These covariances are underestimated compared to the real covariances. From the correlation matrix we see that item 116 has a lower correlation with the other variables. Because this item seems to be responsible for the rejection of the model, it is a good idea to delete this item from the model.

exercise 3.

3 factoren → chi-square = 403 = simple
4 factoren → chi-square = 396 = complex

with df = 3 is 7.815.
< (7 < 7.815) so not significant:
p > 0.05.

Conclusion: The model with 3 factors does not lead to a significant worse fit than the 4 factor model. Therefore we choose 3 factors.