Problem (1), p. 29

S_3 is $e, (12), (13), (23), (123), (132)$

6 members.

These are also members of S_4. They form a subgroup of S_4.

S_3 is not an invariant subgroup since it does not contain all class members of the class containing (12), (e.g. (14)), nor of the class containing (123), (e.g., (124)).

Conjugate subgroups are:

S_3': $e, (12), (14), (24), (124), (142)$

S_3'': $e, (13), (14), (34), (134), (143)$

S_3''': $e, (23), (24), (34), (234), (243)$

S_2 is $e, (12)$

Conjugate subgroups

S_2': $e, (13)$ S_2'''': $e, (2,4)$

S_2'': $e, (14)$ S_2''''': $e, (34)$

S_2''': $e, (23)$