a. \( \Pi_{\text{title}}(\sigma_{\text{dept\_name} = 'Comp. Sci' \land \text{credits}=3}(\text{course})) \)

b. \( \Pi_{\text{ID}}(\sigma_{\text{IID} = 'Einstein'}(\text{takes} \Join \rho_{t1}(\text{IID, course\_id, section\_id, semester, year)}(\text{teaches}))) \)

Assuming the set version of the relational algebra is used, there is no need to explicitly remove duplicates. If the multiset version is used, the grouping operator can be used without any aggregation to remove duplicates. For example, given relation \( r(A, B) \) possibly containing duplicates, \( A, B \mathcal{G}(r) \) would return a duplicate-free version of the relation.

c. \( \mathcal{G}_{\text{max}}(\text{salary})(\text{instructor}) \)

d. \( \text{instructor} \Join (\mathcal{G}_{\text{max}}(\text{salary}) \text{ as } \text{salary}(\text{instructor})) \)

Note that the above query renames the maximum salary as salary, so the subsequent natural join outputs only instructors with that salary.

e. \( \text{course\_id, section\_id} \mathcal{G}_{\text{count}}(*) \text{ as } \text{enrollment}(\sigma_{\text{year}=2009 \land \text{semester}=\text{Autumn}}(\text{takes})) \)

f. \( t1 \leftarrow \text{course\_id, section\_id} \mathcal{G}_{\text{count}}(*) \text{ as } \text{enrollment}(\sigma_{\text{year}=2009 \land \text{semester}=\text{Autumn}}(\text{takes})) \)

result = \( \mathcal{G}_{\text{max}}(\text{enrollment})(t1) \)

g. \( t2 \leftarrow \mathcal{G}_{\text{max}}(\text{enrollment}) \text{ as } \text{enrollment}(t1) \)

where \( t1 \) is as defined in the previous part of the question.

result = \( t1 \Join t2 \)