1. Study and describe two probabilistic models named AFM (Applied Flow Model) and PNI (Probabilistic Noninterference) for noninterference in nondeterministic systems.

2. Consider a time-sensitive RBAC model where there are some time constraints for each role in the system. A user can activate a role whenever the time constraints (defined over the role) are satisfied. Define a new RBAC model (e.g., name it RBAC\textsubscript{4}) based on RBAC\textsubscript{1} model (RBAC with role hierarchies) with the above capability and also specify the login (or create session) procedure in this model.

3. Propose appropriate predicates formalizing “private roles” and “mutually disjoint roles” in RBAC\textsubscript{2}.