

第一部分：

1. Discuss the main characteristics of the database approach and how it differs from traditional file systems? (10%)
2. In the Enhanced ER (EER) model, how does a category differ from a regular shared subclass? What is a category used for? Illustrate your answer with examples. (10%)
3. What are the differences between structured, semistructured, and unstructured data? (10%)
4. What are the typical security classifications? Discuss the simple security property and the *-property, and explain the justification behind these rules for enforcing multilevel security. (10%)
5. Constraint-generating templates can be used to define semantic constraints or business rules. For the following template, please explain what business rule the template expresses. (10%)

EMPLOYEE = {	NAME	, SSN	, ...	,	SALARY	,	SUPERVISORSSN	}
	a	b		c			d	
hypothesis	e	d		f			g	
conclusion				c < f				

第二部分：

6. Discuss the meanings of the existential quantifier (\exists) and the universal quantifier (\forall). (5%)
7. What is meant by a safe expression in relational calculus? (5%)
8. Discuss the options for mapping ER and EER model constructs to relations. (10%)
9. List the three main approaches to database programming. What are the advantages and disadvantages of each approach? What is the impedance mismatch problem? Which of the three programming approaches minimizes this problem? (10%)
10. Prove that any relation schema with two attributes is in BCNF. (10%)
11. A PARTS file with Part# as hash key includes records with the following Part# values: 2369, 3760, 4692, 4871, 5659, 1821, 1074, 7115, 1620, 2428, 3943, 4750, 6975, 4981, 9208. Load these records into expandable hash files based on extendible hashing. Each bucket is one disk block and holds two records. Show the structure of the directory at each step, and the global and local depths. Use the hash function $h(k) = K \text{ mod } 128$. (10%)