1. Using Sandhu’s notation for separation-of-duty
   - Describe a sequence in which different clerks must prepare a purchase order, receive a loading dock receipt, and then issue a check to pay for the order.
   - Describe a sequence in which a manager requests a purchase, a clerk gets bids and chooses a supplier, the order is approved by the purchasing manager, and then the original manager OKs the final issuance of the order.
   - Describe a sequence in which a Vice President or 2 managers can approve a promotion, after which a clerk enters the data, and then a second checks the data.

2. Describe an approvability scenario in which Sandhu’s notation is insufficient to describe.

3. Consider declassification in which a security officer reduces the level of a document, for example for top secret to secret. Can this be done with a lattice? If so, explain how. Otherwise describe a scheme how this scenario can be accommodated.

4. Can the integrity of a computer be ensured by its operating system? Explain the degree to which it can and cannot be ensured.

5. The following techniques have been used to protect passwords. Describe against what attacks they are effective:
   - shadow file
   - one-way hash of the password
   - PAM (Pluggable Authentication Modules)
   - trusted path
   - salt

6. Consider a situation in which retina scans have been used as an authentication mechanism in the presence of an armed guard. As a cost cutting measure, management has decided to get rid of the guard. What effect will this have on security.
7. Banks use 2-factor identification for ATMs (a card and a PIN). Describe the ways in which this is significantly more secure than single factor and why the PIN is so short.

8. What is the advantage of the TCB? What is the disadvantage?

9. What parts of a computer system must be part of the TCB? Explain.

10. When considering integrity, do applications become part of the TCB? How can the size of the TCB be limited?

11. Which of the following actions are authorization or authentication (or both):

   - showing ID
   - having a document notarized
   - withdrawing money from the bank
   - depositing money at the bank
   - adding a signatory to an account