Match the following security concepts with their most precise descriptions:
1. Security: Protection, Access Matrix, Access Control, Revocation of Access Rights, Program Threats, System and Network Threats; Cryptography as a Security Tool, User Authentication, Implementing Security Defenses.
A. A method of converting plaintext into ciphertext using keys to ensure confidentiality.
B. The process of establishing and verifying the identity of a user or system before granting access.
C. A framework that defines permissions and rights associated with subjects over objects in a system.
D. Techniques used to identify, prevent, or mitigate malicious activities aimed at compromising system integrity.
Choose the correct answer from the options given below:
(1) A-D, B-C, C-B, D-A
(2) B-C, A-D, D-B, C-A
(3) C-A, D-B, B-D, A-C
(4) D-B, C-A, A-D, B-C
Answer Key: 2
Solution:
? Cryptography (A): Involves transforming information to protect confidentiality, typically using algorithms and keys.
? User Authentication (B): Confirms the identity of users before granting access.
? Access Matrix (C): Represents permissions of users (subjects) over resources (objects), defining access rights.
? Program and System Threats (D): Encompass various attack vectors and vulnerabilities that security measures aim to prevent or mitigate.
Hence, Option (2) is the right answer.

2. Match the following logical constructs with their correct properties:
2. Mathematical Logic: Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference.
A. A logical equivalence that states that the negation of a conjunction is equivalent to the disjunction of the negations.
B. A form of logic where statements are expressed with variables and quantifiers, allowing for generalization.
C. A rule that allows deriving a conclusion from premises through valid inference patterns in propositional calculus.
D. A logical structure that involves variables ranging over a domain, with statements that can be universally or existentially quantified.
Choose the correct answer from the options given below:
(1) A-C, B-D, C-B, D-A
(2) A-B, B-D, C-A, D-C
(3) A-C, B-D, D-B, C-A
(4) A-D, B-C, C-D, D-B
Answer Key: 2
Solution:
? Propositional Equivalences (A): The equivalence $\neg (p \land q) \equiv \neg p \lor \neg q$ is a classic example.
? Predicates and Quantifiers (B): Enable statements about objects in a domain with quantifiers like $\forall$ and $\exists$.
? Rules of Inference (C): Deductive patterns such as modus ponens facilitate logical derivations.
? Nested Quantifiers (D): Involve layers of quantification, e.g., $\forall x \exists y$, adding complexity.
Hence, Option (2) is the right answer.

3. Match the following aspects of operating system design with their core characteristics:
3. Basics of Operating Systems: Operating System Structure, Operations and Services; System Calls, Operating-System Design and Implementation; System Boot.

A. The sequence of steps and internal components that load the OS into memory during startup.
B. The interface through which user programs request services from the OS.
C. An architecture where the OS is divided into separate modules, such as kernel, shell, and utilities.
D. The collection of functionalities that manage hardware resources and provide environment for executing applications.
Choose the correct answer from the options given below:
(1) A-D, B-C, C-A, D-B
(2) A-B, B-D, C-C, D-A
(3) A-C, B-D, C-A, D-B
(4) A-D, B-A, C-B, D-C
Answer Key: 2
Solution:
? System Boot (A): Involves BIOS or firmware procedures that load the OS during startup.
? System Calls (B): Interface that user-level applications use to request kernel services.
? Operating System Structure (C): Modular design divides OS into components like kernel, shell, and utilities.
? Operations and Services (D): Manage hardware and provide essential services to applications and users.
Hence, Option (2) is the right answer.