Assigment

Q1. Explain the following with suitable terms

i. Tautology

⟹ A tautology is a logical statement that is always true regardless of the truth values of its components. It is valid purely by its structure. Example: "$p \cdot \vee \neg p$" (p or not p) is always true since one part must be true irrespective of p's value.

ii. Contradiction

⟹ A contradiction is a logical statement that is always false regardless of the truth values of its components. Example: "$p \wedge \neg p$" is always false since both parts cannot be simultaneously true or false

iii. Contigency:

⟹ A contigency is a logical statement whose ~~thruth~~ value depends on the specific thruth values of its components. It is nither a tautology nor a contradiction

Example: "$p \to q$" (if p, then q) can be true or false depending on p & q

Q2. Write a note on applications of well ordering principle.

⟹ The Well Ordering Principle states that every non-empty set of positive integers has a least element. This fundamental concept has several key applications:

1. Mathematical Induction: Induction relies on the Well Ordering Principle to ensure that if a counterexample exists, it has a minimal element, leading to a contradiction

2. Algorithm Termination: Algorithms that operate on decreasing positive integers are proven to terminate using the principle since the sequence must reach a minimum.

3. Division Algorithm: The principle is used to prove the Division Algorithm by identifying a minimal remainder in the set of possible values

4. Number Theory Proofs: It is applied to prove the existence of gesles common divisors, prime factorizations, and other number theory concepts

5. Constructive Proofs : The principle exists in constructive proofs by defining objects based on minimality conditions.