**Descriptive Question Bank – DFA (Theory of Computation)**

**Q1.**  
**Design a DFA that accepts all strings over the alphabet {0,1} that contain an even number of 0s.**

* Explain the design process clearly.
* Draw the state diagram and give the transition table.
* Show at least two sample inputs (one accepted, one rejected).

**Q2.**  
**Compare and contrast DFA and NFA (Nondeterministic Finite Automaton).**

* Define both DFA and NFA formally.
* Explain the differences in their transition functions, expressiveness, and practical usage.
* Include an example language that can be accepted by both and show how.

**Q3.**  
**Prove that for every NFA, there exists an equivalent DFA that accepts the same language.**

* State and explain the subset construction method.
* Use a sample NFA and convert it into an equivalent DFA.
* Discuss the implications of this result in terms of language recognition.

**Q4.**  
**Minimize the following DFA and explain the steps in detail.**  
*Given DFA:* (Provide a sample DFA with at least 5 states and redundant transitions)

* Use partitioning or table-filling algorithm.
* Draw both the original and minimized DFAs.
* Discuss how minimization affects performance.

**Q5.**  
**Explain the formal definition of a DFA and describe each component with examples.**

* Define a DFA as a 5-tuple (Q, Σ, δ, q₀, F).
* Describe the role of each component.
* Give a real-world analogy or application where DFA could be useful (e.g., lexical analyzer, vending machine).