[Midterm Exam] Name: ID:

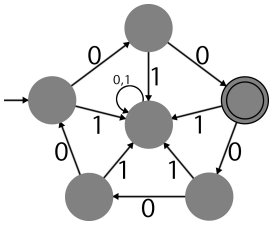
Fall 2022: CS 212: Nature of Computation (L3)

Due: 9:55 am, Wednesday, October 5, 2022. Total Marks: 25

Question 1 [5 points]

Write **T** if the statement is true and **F** otherwise.

1. Every Subset of a Regular language is Regular. _____
2. Let P and Q be regular expressions, then (P + Q)* = P* + Q*. _____
3. The NFA accepts the language 00(00000)*. _____



4. Every nonempty language contains a nonempty Regular language. _____
5. The set of all first names given to children born in 2021 is Regular. _____

Question 2 [10 points]

For each language below, either prove that it is Regular or Context-Free. Assume the binary alphabet for each.

(a) (5 points) The set of all strings that do not contain 1101.

(b) (5 points) The set of all strings that are palindromes. A palindrome is a string that reads the same backwards as forwards, i.e. s is a palindrome if $s = u_1u_2...u_n = u_n...u_2u_1$.

Question 3 [10 points]

(a) (5 points) Prove that $\{0^n1^m |\ n < m\}$ is not regular.

(b) (5 points) Prove that its complement (w.r.t. $\{0,1\}$*) is not regular either.