

Tutorial-9 (11/11/2020)

1. A multi track turing machine can described as a 6-tuple (Q, X, S, d, q_0, F) where X represents:
 - a. input alphabet
 - b. tape alphabet
 - c. shift symbols
 - d. None
2. Next move function δ of a Turing machine $M = (Q, \Sigma, \Gamma, \delta, q_0, B, F)$ is a mapping:
 - a. $\delta : Q \times \Sigma \rightarrow Q \times \Gamma$
 - b. $\delta : Q \times \Gamma \rightarrow Q \times \Sigma \times \{L, R\}$
 - c. $\delta : Q \times \Sigma \rightarrow Q \times \Gamma \times \{L, R\}$
 - d. $\delta : Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R\}$
3. Turing machine corresponds to
 - a. Type 0
 - b. Type 1
 - c. Type 2
 - d. Type 3
4. Construct the Turing machine for 1's and 2's complement .
5. Construct a Turing Machine for language $L = \{ww \mid w \in \{0,1\}^*\}$
6. Which of the functions can a turing machine not perform?
 - a. Copying a string
 - b. Deleting a symbol
 - c. Accepting a palindrome
 - d. Inserting a symbol
7. What could naturally be called an effective procedure that can be realised by Turing machine?
8. Which of the following statements is/are FALSE?
 - a. For every non-deterministic Turing machine, there exists an equivalent deterministic Turing machine.

- b. Turing recognizable languages are closed under union and complementation.
 - c. Turing decidable languages are closed under intersection and complementation.
 - d. Turing recognizable languages are closed under union and intersection.
9. Let $\langle M \rangle$ be the encoding of a Turing machine as a string over $\Sigma = \{0, 1\}$. Let $L = \{ \langle M \rangle \mid M \text{ is a Turing machine that accepts a string of length } 2014 \}$. Then, L is
- a. decidable and recursively enumerable
 - b. undecidable but recursively enumerable
 - c. undecidable and not recursively enumerable
 - d. decidable but not recursively enumerable

Questions to be solved latest by Saturday (14/11/2020)

1. Prove that “Semi-Infinite machines have the same power with Standard Turing machines.”
2. Design turing machine for $L = \{a^p \mid p \text{ is a prime number}\}$
3. Design turing machine for $L = \{ww : w \in \{a,b\}^*\}$

NOTE: Upload your solutions only through the given link. Name your pdf file with the format **$\langle \text{rollno_name_tutorialno} \rangle$** . Do not mail your solutions elsewhere.

Link to upload the solutions:

https://docs.google.com/forms/d/e/1FAIpQLSdJuBjkfIOAVvIDHefA-DBpDzewlEmczjxfwweo4_lbgdw60g/viewform?usp=sf_link