CS60005 : Foundations of Computing Science (Autumn 2024-2025)

Class Test 2

29-Oct-2024 (Tuesday) Maximum Marks: 20 06:00pm – 07:00pm

Roll: _____ **Name:** _____

[*Write your answers in question paper. Answer all questions. Be brief and mathematically / logically precise.*]

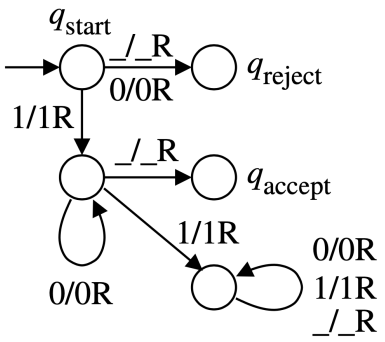
Q1. Let M be a Turing machine with $\mathscr{L}(M) = L$ and with exactly one accept state and exactly one reject state. Construct a Turing machine N by swapping the accept and reject states of M.

Prove or disprove: $\mathscr{L}(N) = \overline{L}$. **(5)**

Solution:

Q2. Prove or disprove: The language recognized by the Turing machine shown below is Turing-decidable.

(5)



Solution:

Q3. Prove that Turing-recognizable languages are closed under union. **(5)**

Solution:

Q4. Let $L_1,\ L_2,\ \ldots,\ L_n$ be pairwise disjoint Turing-recognizable languages over the same alphabet Σ. Suppose that $\bigcup_{i=1}^{n} L_i = \Sigma^*$. Prove that each L_i is Turing-decidable. **(5)**

Solution:

— End of Question Paper —