

Program: BSCS (Even)

Subject: Theory of Automata

Instructor: Mustafa Ali Bamboat

## Assignment – 1

Due Date: 15-Oct-2024 (4<sup>th</sup> Week)

Q1. Explain below statements in aspect of Kleene Star Closure:

- i. Let  $S=\{ab, bb\}$  and  $T=\{ab, bb, bbbb\}$  Show that  $S^* = T^*$  [Hint  $S^* \subseteq T^*$  and  $T^* \subseteq S^*$ ]
- ii. Let  $S=\{ab, bb\}$  and  $T=\{ab, bb, bbb\}$  Show that  $S^* \neq T^*$  But  $S^* \subset T^*$
- iii. Let  $S=\{a, bb, bab, abaab\}$  be a set of strings. Are  $abbabaabab$  and  $baabbbabbaabb$  in  $S^*$ ? Does any word in  $S^*$  have odd number of b's?

[3 Marks]

Q2. Explain below statements in aspect of Kleene Plus Operation:

1. Is there any case when  $S^+$  contains  $\Lambda$ ? If yes then justify your answer.
2. Prove that for any set of strings  $S$

- i.  $(S^+)^+ = S^+$
- ii.  $(S^*)^+ = (S^+)^*$
- iii.  $(S^+)^* = (S^*)^+$

[3 Marks]

Q3. Define Language over the given regular expressions:

- i. Consider the language, defined over  $\Sigma=\{a, b\}$  of words beginning with **a**, then its regular expression may be? and also show with explain string
- ii. Consider the language, defined over  $\Sigma=\{a, b\}$  of words beginning and ending in same letter, then its regular expression may be? and also show with explain string
- iii. Consider the language, defined over  $\Sigma=\{a, b\}$  of words ending in b, then its regular expression may be? and also show with explain string
- iv. Consider the language, defined over  $\Sigma=\{a, b\}$  of words not ending in a, then its regular expression may be? and also show with explain string

[4 Marks]