Tutorial #	<TO BE FILLED BY STUDENT> 4	Student ID	<TO BE FILLED BY STUDENT> L30005[illegible]
Date	<TO BE FILLED BY STUDENT> 26-8-24	Student Name	<TO BE FILLED BY STUDENT> Lokesh

Pre-Tutorial (To be completed by student before attending tutorial session)

1. Let $r = a(a + b)^*$, $s = aa^*b$ and $t = a^*b$ be three regular expressions. Provide the relationship among the languages $L(r)$, $L(s)$, and $L(t)$. Explain.

Solution:

$r = a(a+b)^*$

$s = aa^*b$

$t = a^*b$

L(r): language of r Consists of all strings that start with an a followed by any Combination of as and bs

L(s) : consists of all strings that start with one (or) more No. of a's followed by a single b

L(t): consists of all the strings start with zero (or) any No. of a's followed by a single b.

Relationship:—

1) L(s) is a subset of L(r) and L(t)

2) L(t) is not a subset of L(r)

∴ L(s) is a Common set of both L(r) and L(t)

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2. Write the regular expression corresponding to the language L where L = { x ∈ {0, 1}* | x ends with 1 and does not contain substring 00 }. Explain.

Solution:

→ End with 1

→ Does not Contain 00

$L = (1+01)^*1$

$L = \{1, 11, 101, 1101, \ldots\}$

3. Prove that $a(ba)^*b = ab(ab)^*$

Solution:

The string accepted by or Can be written as $a(ba^*)b$

is $ab + abab + ababab + \ldots$

$ab(ab)^* = ab + abab + ababab + \ldots$

The Expanded form the strings accepted are equal

$\therefore a(ba)^*b = ab(ab)^*$

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IN-TUTORIAL (To be carried out in presence of faculty in classroom)

1. Prove that $(1 + 00^*1) + (1 + 00^*1)(0 + 10^*1)^*(0 + 10^*1) = 0^*1(0 + 10^*1)^*$

Solution:

LHS = $(1+00^*1)+(1+00^*1)(0+10^*1)^*(0+10^*1)$

$=(1+00^*1)[\epsilon+(0+10^*1)^*(0+10^*1)]$

$=(1+00^*1)(0+10^*1)^*$

$=1[\epsilon+00^*][0+10^*1)^*$

$=10^*(0+10^*1)^*$

$=0^*1(0+10^*1)^*$

Hence proved LHS = RHS

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2. Give **TWO** R.E.s for representing the set L of strings in which every 0 is immediately followed by at least two 1s.

Solution: (i) $R_1 = (1^*)(011)^*(1^*)$

(ii) $R_2 = (1^*(011^*)1^*)$

3. Prove $(a+b)^* = a^*(ba^*)^*$ using identity rules of regular set.

Solution:

$(a+b)^* = \epsilon + (a+b) + (a+b)(a+b) + \cdots$

$= \epsilon + a + b + aa + ab + ba + bb + \cdots$

$= (\epsilon + a + aa + \cdots) + (b + ab + \cdots)$

$= a^* + (b + ab + \cdots)$

$= a^* + b(\epsilon + a + \cdots)$

$= a^* + ba^*$

$= a^*(\epsilon + ba^*)$

$= a^*(ba^*)$

LHS = RHS

Hence Proved.

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Post-Tutorial (To be carried out by student after attending the tutorial session)

1. Find the regular expression representing the set of all strings of the form $a^m b^n c^p$ *where* $m, n, p \geq 1$

Solution:

$L = \{abc, aabbcc, aaabbbccc, ----\}$

$= (a^* a)(b^* b)(c^* c)$

2. Find the sets represented by the regular Expression $(aa)^* + (aaa)^*$

Solution:

The sets are $\{aa, aaaa, ----, aaa, aaaa, ---\}$

3. Prove that $P + PQ^*Q = a^*bQ^*$ where $P = b + aa^*b$ and Q is any regular expression.

Solution:

$\Rightarrow (b + aa^*b) + (b + aa^*b)Q^*Q = a^*b^*Q^*$

$\Rightarrow (b + aa^*b) + (b + QQ^*b)\,Q^*Q = bQ^* + aa^*bQ^*$

$\Rightarrow a^*bQ^*$

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Viva Questions

1. What is the relationship between regular sets and regular expressions? How do they help us describe and analyze patterns in strings?

Answer: Regular sets are the languages described by regular expression and they represent patterns in string that can be matched

2. How do we determine whether two regular expressions are equivalent, and what are the implications of equivalence in terms of language recognition and automata theory?

Two regular expression are equivalent if they describe the same regular language which means the generate (or) match the same set of strings.

(For Evaluator's use only)

Comment of the Evaluator (if Any)	Evaluator's Observation Marks Secured:_____out of **50** Full Name of the Evaluator: Signature of the Evaluator Date of Evaluation: