Branch : CSE & IT **Batch : Hinglish**

Theory of Computation

Finite Automata

Regular Expression Part-1

DPP-02

[MSQ]

1. Which of the following is/are true?

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

(b) $(a + \in)^+ = a^+$

(c) $(a + b)^* (ba)^* = (ab)^* (a + b)^*$

(d) $(ab + ba)^* = (ab(ab)^* + ba(ba)^*)^*$

[MCQ]

2. Consider the following regular expressions:

(I) $a^* b^* + a^*$

(II) $(\in + aa^*) (bb^* + \in)$

(III) $b^*a^* + a^*b^* + b^*$

(IV) $aa^+ bb^+$

Which the following is equivalent to a^*b^*?

(a) (I) and (II) only

(b) (I) only

(c) (II) and (III) only

(d) (I) and (IV) only

[MCQ]

3. Which of the following is not correct?

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

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

(c) $a^+a^+ = a^+$

(d) $\phi^* = \in$

[MSQ]

4. Regular expression can be used in:

(a) Lexical Analysis

(b) Pattern matching

(c) String matching

(d) Syntax analysis

[MCQ]

5. Consider the regular expression:

regular expression = $a^*b(a + ba^*)^*$

Above regular expression is equivalent to which of the following below regular expression?

(a) $ba^*(bb)^*$

(b) $ba^*(a + ba^*b)^*$

(c) $(b + aa^*b) + (b + aa^*b) (ba^*b + a) (ba^*b + a)^*$

(d) $a^*b (a + b)^*$

[MCQ]

6. Which of the following statement will generate finite language?

(a) PDA with finite stack.

(b) Regular expression without kleene star and kleene plus.

(c) Regular expression with unary alphabet.

(d) Regular expression with binary alphabet.

[MCQ]

7. Consider following regular expressions:

[I] $(ab)^*a = a(ab)^*$

[II] $(bb)^*b^* = b^*$

[III] $(b + \in)^+ = b^*$

Which of the following is correct?

(a) II and III only.

(b) I and II only.

(c) All are correct.

(d) None of these are correct.

[NAT]

8. Consider the string $\left[\left((ab)^{10}(ab)^7(ab)^6\right)^2\right]$, the length of the string is ____.

Answer Key

1. **(a, c, d)**
2. **(a)**
3. **(c)**
4. **(a, b)**
5. **(d)**
6. **(b)**
7. **(c)**
8. **(46)**

Hints and Solutions

1. (a, c, d)

(a) $(a^*b^*)^* = \{\in, a, b, \ldots\}^*$
$= (a + b)^*$
$(b^*a^*) = \{\in, a, b, \ldots\}^*$
$= (a + b)^*$ True

(b) $(a + \in)^+ = a^+ + \in$
$= a^*$ False

(c) $(a + b)^* (ba)^* = (a + b)^* \in$
$= (a + b)^*$
It will generate all the strings on alphabet {a, b}
$(ab)^* (a + b)^* = \in(a + b)^*$
$= (a + b)^*$ True

(d) $\{(ab) (ab)^* + (ba) (ba)^*\}^*$
$= (ab + ba)^*$ True

2. (a)

Regular expression = a^*b^*
$a^* = \in + aa^*$
$b^* = \in + bb^*$

- $a^*b^* + a^* = a^*b^*$
- $a^*b^* + a^* = (\in + aa^*) (bb^* + \in)$

Hence, (a) is correct.

3. (c)

(a) $a^*bb^* = a^*b^+$ Correct
Because $rr^* = r^+$

(b) $a^*a^+ = a^+$ Correct
$r^*r^+ = r^+ = rr^*$ All are equal

(c) $a^+a^+ = aa^*aa^*$ Incorrect
$= (aa)a^*$

(d) $\phi^* = \in$ Correct

* contain minimum string $\in$.

4. (a, b)

Regular expression can be used in pattern matching, lexical analysis, text editing etc.

5. (d)

$a^*b (a + ba^*)^*$
Put $a^* = \in$
$a^*b (a + b)^*$

6. (b)

- PDA with finite stack is same as DFA, and DFA can generate finite and infinite language.
- Regular expression without kleene star(*) always generate finite language.

Note: Kleene plus(+) is an expansion of kleene star(*).

- a^* = infinite
- $(0 + 1)^*$ = infinite

7. (c)

- $(ab)^*a = a(ab)^*$ True
  $(pq)^*p$ is same as $p(qp)^*$
- $(bb)^* b^* = \{\in, b, bb, bbb, bbbb \ldots.\}$
  $= b^*$
- $(b + \in)^+ = (b^+ + \in) = b^*$ True

All are correct.

8. (46)

$$\left[\left((ab)^{10}(ab)^7(ab)^6\right)^2\right]$$
$$=\left((ab)^{17}(ab)^6\right)^2$$
$$=(ab)^{23*2}$$

Length of the string = 46.