



Kunal Jha

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 Computer Science Engineering(CS)

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MULTIPLE SUBJECT : THEORY OF COMPUTATION + COMPILER DESIGN (GATE - 2020) - REPORTS

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Q. 1
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Which of the following regular expression does not contain string '00010'?

A $0001^*(0+1)$

B $0(0+1)^*(0+1)$

C $(11+00)^*(0+1)^*0$

D $(11+(00)^*)^*$

[Correct Option](#)
Solution :

(d)

Considering each option once,

(a) $0 \quad 0 \quad 0 \quad 1^* \quad (0+1)$

$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$
 $0 \quad 0 \quad 0 \quad 1 \quad 0$, hence its a member.

(b) $0(0+1)^*(0+1)$

$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$
 $0 \quad (0+1) \quad (0+1) \quad (0+1) \quad (0+1)$
 $0 \quad 0 \quad 0 \quad 1 \quad 0$, hence its a member.

(c) $(11+00)^*(0+1)^*0$

$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$
 $(11+00) \quad (0+1) \quad (0+1) \quad 0$
 $00 \quad 0 \quad 1 \quad 0$, hence its a member.

(d) $(11+(00)^*)^*$

In this regular expression, number of 0's will always be divisible by 2, but the given string contains three zeros, which illustrates that, the string is not a member of the given regular expression.


Q. 2
[Have any Doubt ?](#)


Which of the following is true?

A Lexical analyser read the stream of characters making up the source program and group the characters into an abstract syntax tree.

B Type checking is done during syntax analysis phase of a compiler.

C Symbol table is constructed during the analysis part of a compiler.

[Correct Option](#)
Solution :

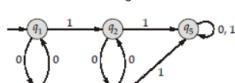
(c)

Lexical analyser read the stream of character and produce lexemes. Type checking is done during semantic analysis phase of a compiler. Symbol table is constructed during the analysis part of a compiler.

D None of these


Q. 3
[▶ Solution Video](#)
[Have any Doubt ?](#)


Consider the following finite state machine 'M' over alphabet $\Sigma = \{0, 1\}$ where ' q_1 ' is the start state and ' q_4 ' is the final state,



The language of M is

A $L = \{w \mid w \text{ has exactly one '1'}$

B $L = \{w \mid w \text{ has even number of 0's}\}$

C $L = \{w \mid w \text{ has odd number of 1's}\}$

D $L = \{w \mid w \text{ has exactly one '1' and } |w| \text{ is even}\}$

[Correct Option](#)

Solution :

(d)

Considering each of the options:

- ' $w' = 1$ is present in the language but can't be accepted by M.
- ' $w' = 00$ is present in the language but can't be accepted by M.
- ' $w' = 111$ is present in the language but can't be accepted by M.

Option (d) is correct.

QUESTION ANALYTICS



Q. 4

Have any Doubt ?



Consider the following augmented grammar?

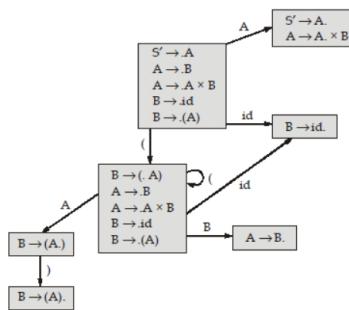
$$\begin{aligned} S' &\rightarrow A \\ A &\rightarrow B | A \times B \\ B &\rightarrow id \mid (A) \end{aligned}$$

Initially it contains ($S' \rightarrow .A$) which of the following is not a closure?

A $S' \rightarrow A.$

Correct Option

Solution :
(a)



$S' \rightarrow A.$ is not a closure.

B $A \rightarrow .A \times B$

C $B \rightarrow .id$

D None of these

QUESTION ANALYTICS



Q. 5

Solution Video

Have any Doubt ?



Let $L_1 = \{a^n b^m c^n \mid m, n \geq 0\}$ and $L_2 = \{a^n b^n \mid n \geq 0\}$. If, $L = L_1 - L_2$ then L is

A Finite language

B Regular

C DCFL

Correct Option

Solution :
(c)

$$\begin{aligned} L &= \{L_1 - L_2\} \\ &= \{a^n b^m c^n\} - \{a^n b^n\} \\ &= \{a^n b^m c^n\} - \{a^n b^m c^n \cap a^n b^n\} \\ &= \{a^n b^m c^n \mid m, n \geq 0\} - \{\epsilon\} \\ &= \text{DCFL} - \text{Regular} = \text{DCFL} \end{aligned}$$

D CFL but not DCFL

QUESTION ANALYTICS



Q. 6

Have any Doubt ?



Which of the following is true?

A Every SLR grammar is unambiguous but not every unambiguous grammar is SLR.

Correct Option

Solution :
(a)

Every SLR grammar is unambiguous but not every unambiguous grammar is SLR.
LR (1) does not use back tracking.

An ambiguous grammar can never be LR (K) for any K.

B LR (1) is the most powerful back tracking shift reduce parsing method.

C An ambiguous grammar can be LR (K) for any K.

D None of these

QUESTION ANALYTICS

Q. 7

Have any Doubt ?



Consider the operator precedence relation:

	id	+	×	\$
id	>	>	>	
+	<	>	>	
×	<	<	<	
\$	<	<	<	

String $id_1 + id_2 * id_3$ is evaluated, what is the order in which id_1 , id_2 and id_3 will be evaluated.

A id_1, id_2, id_3

B id_1, id_3, id_2

C id_3, id_2, id_1

D id_1, id_2, id_3

Correct Option

Solution :

(d)

In the operator precedence table $+, > \times$ which means $+$ has higher precedence than \times and left to right.

So order of evaluation will be id_1 , id_2 and id_3 .

QUESTION ANALYTICS



Q. 8

Solution Video

Have any Doubt ?



Consider the grammar $G(V, T, P, S)$ which generates a language L. Consider another grammar $G' V \cup \{S, T, P', S'\}$ where $P' = P \cup \{S' \rightarrow SS\}$. Which of the following represents the $L(G)$?

A L^*

B L^2

Correct Option

Solution :

(b)

The above language represents L^2 .

C L^+

D None of these

QUESTION ANALYTICS



Q. 9

Have any Doubt ?



Consider the following statements:

- I. The set of strings described by a rule is called pattern associated with the token.
- II. Dynamic memory allocation is not performed during compilation.
- III. Graph that shows the basic blocks and their successor relationship is called DAG.

Number of correct statement is/are _____

1

Correct Option

Solution :

1

- I. The set of strings described by a rule is called grammar.
- II. Dynamic memory allocation is not performed during compilation.
- III. Graph that shows the basic blocks and their successor relationship is called control graph.

QUESTION ANALYTICS



Consider the following expression:

$25 \times 3 - 18 + 23 - 8 \times 6 / 3$

\times has highest precedence and left associative $-$, $+$, $/$ have equal precedence and right associate. Output of the above expressions is _____.

50

Correct Option

Solution :

50

$$\begin{aligned}\text{Expression: } & ((25 \times 3) - (18 + (23 - ((8 \times 6)/3)))) \\ &= (75 - (18 + (23 - (48/3)))) \\ &= (75 - (18 + (23 - 16))) \\ &= (75 - (18 + 7)) \\ &= (75 - 25) = 50\end{aligned}$$

QUESTION ANALYTICS

+

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OVERALL ANALYSIS COMPARISON REPORT **SOLUTION REPORT**

ALL(33) CORRECT(0) INCORRECT(0) SKIPPED(33)

Q. 11

Solution Video

Have any Doubt ?



Consider the following languages:

$$L_1 : \{a^p b^q | p, q > 0\}$$

$$L_2 : \{a^p b^q a^q b^p | p, q > 0\}$$

Consider the following statements with respect to above languages.

S_1 : Complement of L_1 is DCFL.

S_2 : Reverse of L_2 is not CSL.

S_3 : Intersection of L_1 and L_2 is CFL but not regular.

S_4 : Both L_1 and L_2 are CSL.

Number of not correct statement _____.

2

Correct Option

Solution :

2

$$L_1 : \{a^p b^q | p, q > 0\} = \{a^{p+q} | p, q > 0\} = \{a^t | t = p + q\}$$

Here push, pop are clear i.e. when to push and when to pop and contain only 1 comparison i.e.

$t = p + q$ so it is DCFL.

$$L_2 : \{a^p b^q a^q b^p | p, q > 0\}$$

L_2 is DCFL.

Considering the options,

S_1 : $(DCFL)^C = DCFL$, so true.

S_2 : $(DCFL)^R = (CFL)^R = CFL$ (by closer property). Every CFL is CSL so S_2 is false.

S_3 : $L_1 \cap L_2 = \{a^p b^q | p, q > 0\} \cap \{a^p b^q a^q b^p | p, q > 0\} = \emptyset \Rightarrow$ Regular. So S_3 is false.

S_4 : Both L_1 and L_2 are DCFL and hence CSL. So S_4 is true.

QUESTION ANALYTICS



Q. 12

Have any Doubt ?



Consider the following grammar:

$$A \rightarrow BA'$$

$$A' \rightarrow +BA' | \in$$

$$B \rightarrow CB'$$

$$B' \rightarrow xCB' | \in$$

$$C \rightarrow (A) | id$$

The number of elements in FOLLOW (B) is _____.

3

Correct Option

Solution :

3

$$\begin{aligned} FOLLOW(B) &= FOLLOW(A') \\ &= \{+\} \cup FOLLOW(A) \cup FOLLOW(A') \end{aligned}$$

Because FIRST (A) contain \in

$$\begin{aligned} &= \{+\} \cup \{\$,)\} \cup \{\$\} \\ &= \{+, \), \$\} \end{aligned}$$

Total 3 elements.

QUESTION ANALYTICS



Q. 13

Solution Video

Have any Doubt ?



Consider two languages L_1 and L_2 where L_1 is reducible to L_2 and L_2 is reducible to L_3 and L_3 is a decidable language. Number of statement which is valid with respect to L_1 and L_2 _____.

S_1 : $L_1 \cap L_2$ is decidable.

S_2 : Complement of L_1 is undecidable.

S_3 : Homomorphism of L_1 is decidable.

1

Correct Option

Solution :

1

L_1 and L_2 are decidable

$$\therefore L_1 \cap L_2 = REC \cap REC = REC \text{ (decidable)}$$

Note: Turing decidable languages are recursive languages.

\therefore Recursive languages are not closed under homomorphism and are closed under complement

So, S_1 is correct.

QUESTION ANALYTICS



Q. 14

[Have any Doubt ?](#)

Consider the following statements:

- I. Top down parsing method is also called shift reduce parsing.
 - II. The bottom-up parsing method is also called predictive parsing.
- Number of correct statements _____.

0

Correct Option

Solution :

0

- I. Top down parsing method is not called shift reduce parsing.
 - II. The bottom-up parsing method is also called shift reduce parsing.
- Both I and II is not correct.

 QUESTION ANALYTICS

Q. 15

[Solution Video](#)[Have any Doubt ?](#)

Consider the following languages:

- $$\begin{aligned}L_1 &= \{a^n \mid n \text{ is not a prime number}\} \\L_2 &= \{a^n \mid n = k^3 \text{ for some } k \geq 0\} \\L_3 &= \{a^n \mid n = 2^k \text{ for some } k \geq 0\}\end{aligned}$$
- Number of regular language _____.

0

Correct Option

Solution :

0

- $L_1 : \{a^n \mid n \text{ is not a prime number}\}$. \bar{L}_1 will be $\{a^n \mid n \text{ is a prime number}\}$. Since \bar{L}_1 is CSL and CSL are closed under complement, hence L_1 is CSL but not regular.
- $L_2 :$ It will have strings $L = \{a^{k^3}\}$ contain non linear power. DFA is not possible. Hence, language is not regular.
- $L_3 :$ This language is not regular $L = \{a^{2^k}\}$ non linear power. DFA is not possible. Hence, language is not regular.

 QUESTION ANALYTICS

Q. 16

[Solution Video](#)[Have any Doubt ?](#)

Consider the language L :

$L = \{< M > \mid M \text{ is a Turing Machine and } L(M) \leq_p \{0^p 1^{2p} \mid p > 0\}\}$ Where the symbol ' \leq_p ' refers to polynomial time reducible. Number of correct statement about

- $S_1 : L$ is decidable
 $S_2 : L$ is regular

0

Correct Option

Solution :

0

The language $\{0^p 1^{2p}\}$ is context-free language, hence it is recursive also. Since $L(M) \leq_p \text{REC}$, so $L(M)$ also recursive, now given input (i.e. recursive language) to turing machine and finding it is accept or not is non-trivial property so it is undecidable by Rice's theorem.

 QUESTION ANALYTICS

Q. 17

[Have any Doubt ?](#)

Consider the following grammar:

- $$\begin{aligned}S &\rightarrow aAb \\A &\rightarrow aB \mid aA \\B &\rightarrow Bb\end{aligned}$$

Which of the following is correct about above grammar?

A CLR (1) but not SLR (1)**B** SLR (1) but not LR (0)**C** Both SLR (1) and LR (0)**D** None of these

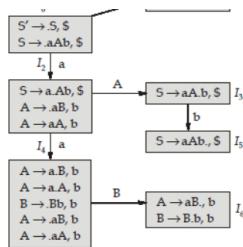
Correct Option

Solution :

(d)

CLR (1) parser:

 $I_a \quad S \xrightarrow{S' \rightarrow S, \$} I_1$



In canonical item I_6 , $A \rightarrow aB, b \quad B \rightarrow B \cdot b, b$ will have a shift-reduce conflict. Grammar is not CLR (1) so it is also not SLR (1) and LR (0).

QUESTION ANALYTICS

Q. 18

Have any Doubt ?



Consider the following grammar:

$E \rightarrow EzE \mid xyE \mid w$

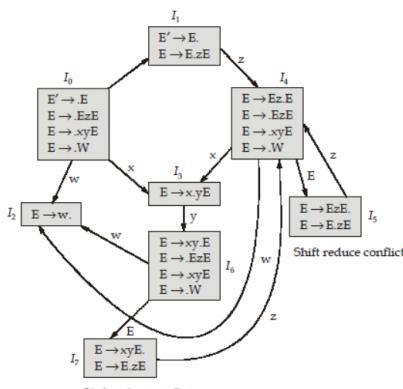
Which of the following conflict present in SLR (1) parser construction of above grammar?

Shift-reduce conflict

Correct Option

Solution :

(a)



There is only shift-reduce conflict.

Reduce-reduce conflict

Both (a) and (b)

No conflict present

QUESTION ANALYTICS



Q. 19

Solution Video

Have any Doubt ?



Which language does the following PDA accept $M = \{q_0, q_1\}, \{0, 1\}, \{z_0, x\}, \delta, q_0, z_0, q_2\}$ and δ is given as:

$$\delta(q_0, 0, z_0) = (q_0, xz_0)$$

$$\delta(q_0, 0, x) = (q_0, xx)$$

$$\delta(q_0, 1, x) = (q_1, x)$$

$$\delta(q_1, 1, x) = (q_1, \epsilon)$$

$$\delta(q_1, \epsilon, z_0) = (q_2, z_0)$$

$L = \{0^n 1^n \mid n \geq 0\}$

$L = \{0^n 1^n \mid n \geq 1\}$

$L = \{0^n 1^{n+1} \mid n \geq 0\}$

$L = \{0^n 1^{n+1} \mid n \geq 1\}$

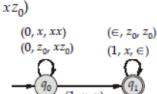
Correct Option

Solution :

(d)

The transition function

$$\delta(q_0, 0, z_0) = (q_0, xz_0)$$



represents that when input is 0, stack top is z_0 and current state is q_0 than the stack top becomes xz_0 and state remains at q_0 . On every '0' input to the machine, 'x' is pushed to the stack on first '1',

a skip operation is performed followed by a pop operation on every 1. At last, when string is finish and stack is empty, the string is said to be accepted.
Hence, $L = \{0^n 1^{n+1} \mid n \geq 1\}$

QUESTION ANALYTICS



Q. 20

Solution Video

Have any Doubt?



Consider the following two languages:

$$S_1 : L_1 = \{\langle M \rangle \mid M \text{ is a TM and } |L(M)| \geq 3\}$$

$$S_2 : L_2 = \{\langle M \rangle \mid M \text{ is a TM and } |L(M)| < 3\}$$

Which of the following is correct?

A Only S_1 is REC

B Only S_2 is REC

C Both S_1 and S_2 are REC

D None of the above is REC

Correct Option

Solution:

(d)

$$L_1 = \{\langle M \rangle \mid M \text{ is a TM and } |L(M)| \geq 3\}$$

Some TM belongs $|L(M)| \geq 3$, some does not. So it is L_1 is non REC.

$$L_2 = \{\langle M \rangle \mid M \text{ is a TM and } |L(M)| < 3\}$$

Some TM belongs $|L(M)| < 3$, some does not. So it is L_2 is non REC.

QUESTION ANALYTICS



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ALL(33) CORRECT(0) INCORRECT(0) SKIPPED(33)

Q. 21

Have any Doubt ?

Any directed acyclic graph must have

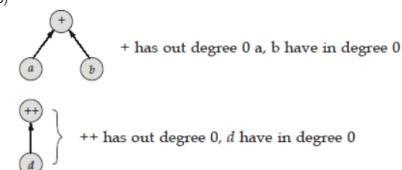
A Atleast one vertex with in degree 0 or atleast one vertex with out degree 0.

B Atleast one vertex with in degree 0 and atleast one vertex with out degree 0.

Correct Option

Solution :

(b)



One vertex with out degree 0 and one vertex with in degree 0.

C Atleast one vertex with in degree 0 and atleast one vertex with out degree 1.

D Atleast one vertex with in degree 1 and atleast one vertex with out degree 0.

QUESTION ANALYTICS

Q. 22

Have any Doubt ?

Consider the following grammar production:

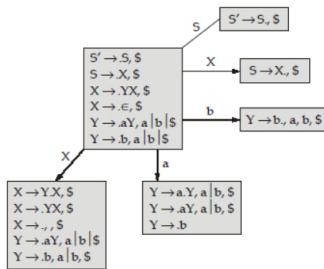
$S \rightarrow X$
 $X \rightarrow YX \mid \epsilon$
 $Y \rightarrow aY \mid b$

Which of the following is not LR (1) item set?

A $\{Y \rightarrow a, a \mid b \mid \$\}$

Correct Option

Solution :
 (a)



$Y \rightarrow a, a \mid b \mid \$$ is not a LR (1) item.

B $\{S \rightarrow X, .\mid \$\}$

C $\{Y \rightarrow a, Y, a \mid b \mid \$$
 $Y \rightarrow .ay, a \mid b \mid \$\}$

D $\{Y \rightarrow b, a \mid b \mid \$\}$

QUESTION ANALYTICS

Q. 23

Solution Video

Have any Doubt ?

Consider the following languages:

$L_1 : \{a^n b^\ell a^k ; n > 5, \ell > 3, k \leq \ell\}$
 $L_2 : \{a^n b^m \mid n \geq 1, m \geq 1\} \cap \{a^n b^n \mid n \geq 1\}$

Which of the following statement is true?

A Both L_1 and L_2 are regular

B L_1 is regular but L_2 is non-regular

C L_2 is regular but L_1 is non-regular

D Neither of L_1 or L_2 is regular

Correct Option

Solution :

(d)

Considering the languages:

L_1 : This language is non-regular, since 'b' can be any in number more than 3, so a's should in such a way that they are less than or equal to 'b' which needs a comparison.

Hence language is DCFL.

$L_2 : \{a^n b^m \mid n \geq 1, m \geq 1\} \cap \{a^n b^n \mid n \geq 1\}$

$= \{a^n b^n \mid n \geq 1\}$

Which is a non regular DCFL.

Hence, both L_1 and L_2 are non-regular.

QUESTION ANALYTICS

+

Q. 24

Have any Doubt ?

Q

Consider the following grammar with given production rule:

$S \rightarrow xxW$ [print "1"]

$S \rightarrow y$ [print "2"]

$W \rightarrow Sz$ [print "3"]

What is the translation of $xxxxyzz$ using the above SDT?

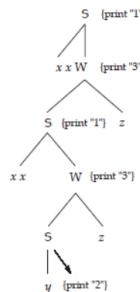
A 11233

B 23131

Correct Option

Solution :

(b)



It will print "23131".

C 21231

D 13213

QUESTION ANALYTICS

+

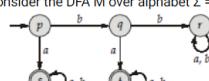
Q. 25

Solution Video

Have any Doubt ?

Q

Consider the DFA M over alphabet $\Sigma = \{a, b\}$ is given below:



Consider the following statement about above DFA:

S_1 : Complement of $L(M)$ is context-sensitive.

S_2 : $L(M) = (a(a+b)^*) + ba(a+b)^* + bb(a+b)^*$.

S_3 : For the language accepted by M, the minimum DFA of M will contain 3 states.

S_4 : M accepts all strings over $\{a, b\}$ that ends with 'a'.

Number of false statements _____.

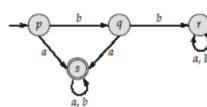
3

Correct Option

Solution :

3

- A is a DFA. So, $L(A)$ is regular. Complement of $L(A)$ is also regular since regular languages are closed under complement.
- $L(A) = ((a+ba)(a+b)^*)$ or can be written as $(a(a+b)^* + ba(a+b)^*)$.
- The minimal DFA will be.



- 'bba' ends with 'a' but is not accepted by the above automata.

QUESTION ANALYTICS



Q. 26

Have any Doubt ?



Consider the following grammar:

$$\begin{aligned} S &\rightarrow XY \\ X &\rightarrow xX \mid \epsilon \\ Y &\rightarrow y \mid yY \end{aligned}$$

Consider following statements with respect to this grammar.

S₁: First (S) contain 2 elements.

S₂: During construction of LR (0) parser, atleast one state of canonical item will have shift reduce conflict. The number of correct statements are _____.

2

Correct Option

Solution :

2

- First (S) = First (XY)

$$\begin{aligned} &= \{\text{First}(X) - \epsilon\} \cup \{\text{First}(Y)\} \\ &\dots(1) \end{aligned}$$
- First (X) = {x, ε}

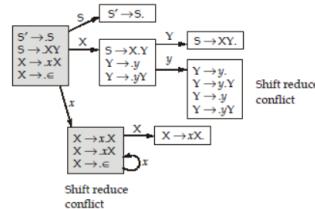
$$\dots(2)$$
- First (Y) = {y}

$$\dots(3)$$

From (1), (2) and (3)

$$\text{First}(S) = \{x, y\}$$

• LR (0) parser:



QUESTION ANALYTICS

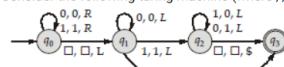


Q. 27

Have any Doubt ?



Consider the following turing machine (where ., \$ is represent accept the string).



If the input string is 01010 then output is _____.

10110

Correct Option

Solution :

10110

The given turing machine perform 2's complement of the given input.

So output will be 01010 \implies 10101 $\xrightarrow{2's \text{ complement}}$ 10110

QUESTION ANALYTICS



Q. 28

Have any Doubt ?



Consider the following expression:

$$((x + y) - ((x + y) * (x + y))) + ((x + y) * (x + y)) + ((x + y) + (x + y))$$

The number of nodes to represent the DAG for the above expression is _____.

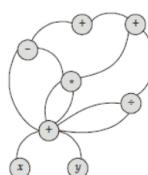
8

Correct Option

Solution :

8

DAG for the expression is



QUESTION ANALYTICS



Q. 29

[▶ Solution Video](#)[Have any Doubt ?](#)

Consider the following CFG: $S \rightarrow 0S0 \mid 1S1 \mid 0 \mid 1 \mid \epsilon$.

For the above CFG, the total number of strings generated whose length is less than or equal to 7 [exclude the empty string] is _____.

44

Correct Option

Solution :

44

The language is palindrome language on $\Sigma = \{0, 1\}$.

Number of even palindrome of length on binary alphabet = $2^{n/2}$

Length 0 $\rightarrow 2^{0/2} = 1$ (excluded)

Length 2 $\rightarrow 2^{2/2} = 2$

Length 4 $\rightarrow 2^{4/2} = 4$

Length 6 $\rightarrow 2^{6/2} = 8$

So sum of all even length string = 14

Number of odd palindrome of length n = number of even length palindrome of length $(n - 1) \times 2$

Length 1 $\rightarrow 1 \times 2 = 2$

Length 3 $\rightarrow 2 \times 2 = 4$

Length 5 $\rightarrow 4 \times 2 = 8$

Length 7 $\rightarrow 8 \times 2 = 16$

So sum of all odd length string = 30

So sum of all length strings = $14 + 30 = 44$.

QUESTION ANALYTICS



Q. 30

[▶ Solution Video](#)[Have any Doubt ?](#)

The length of shortest string not in the language over alphabet {a, b} of following regular expression is _____.

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

3

Correct Option

Solution :

3

String of length 0 : ϵ , accepted.

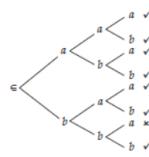
String of length 1 : a, b accepted.

String of length 2 :



aa, ab, ba, bb accepted.

String of length 3 :



bba is not accepted.

QUESTION ANALYTICS



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Q. 31
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Consider the following CFG, with S as the starting symbol:

 $S \rightarrow SS|ab$
 $A \rightarrow B|C$
 $C \rightarrow de G|\epsilon$
 $G \rightarrow c$

The length of the shortest string of the grammar which is ambiguous _____.

6
[Correct Option](#)
Solution :

6

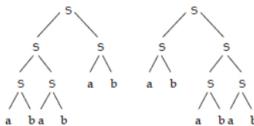
Here, production rules of A, C and G are useless since there is no way to reach till them for the starting symbol.

Hence, the reduced CFG is:

 $S \rightarrow SS$
 $S \rightarrow ab$

Consider the string "ab ab ab"

Constructing parse trees for the same:



Here 2 parse trees are constructed which declare the grammar as ambiguous.

Hence 6 is the minimum length of the string, to consider this grammar as ambiguous.

QUESTION ANALYTICS

Q. 32
[Have any Doubt ?](#)

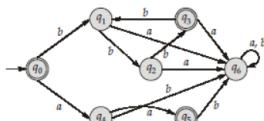

Consider the following regular expression:

 $R = (a^2)^* + (b^3)^*$

The minimum number of states needed in construction of DFA for L(R) is _____.

7
[Correct Option](#)
Solution :

7



So, minimal number of states needed in construction of DFA for L(R) is 7.

QUESTION ANALYTICS

Q. 33
[Have any Doubt ?](#)


Consider the following expression: $i + j \times k + l - m - i + j \times k$

Order of precedence \times , $+$ and $-$ has highest precedence, $-$ is left associative and associativity of \times , $+$ does not matter. The minimum number of total variables are required in 3 address code for the above expression _____.

7
[Correct Option](#)
Solution :

7

Minimum number of variables required $i + j \times k + l - m - i + j \times k$

 $((i + (j \times k)) + l) - m - (i + (j \times k))$

Equivalent 3-address code:

$$\begin{aligned} t_1 &= j \times k \\ t_2 &= i + t_1 \\ t_3 &= t_2 + l \\ t_4 &= t_3 - m \\ t_5 &= t_4 - t_1 \end{aligned}$$

Total $t_1, j, k, i, t_2, l, m, t_5$, 7 variables required.

