

COMMON DATA BASED QUESTIONS

Q1. The set denoted by the regular expression $(1+01+001)^(\epsilon+0+00)$ is accepted by the finite automata, $M=(\{Q0, Q1, Q2, Q3\}, \{0, 1\}, Q0, \delta, \{Q0, Q1, Q2\})$ where δ is given by the transition table*

	<i>0</i>	<i>1</i>
<i>Q0</i>	<i>Q1</i>	<i>Q0</i>

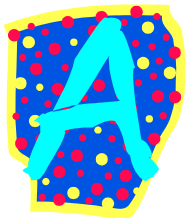
$Q1$	$Q2$	$Q0$
$Q2$	$Q3$	$Q0$
$Q3$	$Q3$	$Q3$

Q1(a) The set accepted by the finite automata is the set of all strings over $\{0,1\}$

- A. not containing three consecutive 0's*
- B. containing three consecutive 0's*
- C. even number of 0's*
- D. even number of 1's*

Q1(b) The minimal finite automata for the above set has

- A. 3 states*
- B. 4 states*
- C. 5 states*
- D. none of the above*



Answer: Q1(a) A Q1(b) B

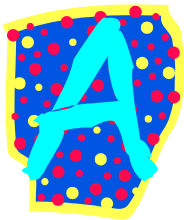
Q2. The set denoted by the regular expression $[00+11+(01+10)(00+11)^(01+10)]$ is accepted by the finite automata, $M=(\{Q0,Q1,Q2,Q3\},\{0,1\},Q0,\delta,\{Q0,Q1,Q2\})$ where*

δ is given by the transition table

	0	1
Q_0	Q_1	Q_2
Q_1	Q_0	Q_3
Q_2	Q_3	Q_0
Q_3	Q_2	Q_1

Q2(a) The set accepted by the finite automata is the set of all strings over $\{0,1\}$

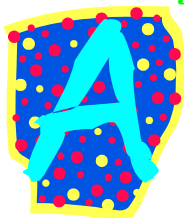
- E. containing an even number of 1's and an even number of 0's
- F. containing three consecutive 0's
- G. even number of 0's
- H. even number of 1's



Answer: Q1(a) E

Q2(b) The minimal finite automata for the above set has

- E. 3 states
- F. 4 states
- G. 5 states
- H. none of the above



Answer:F

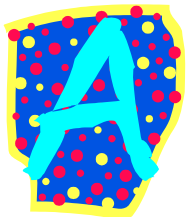
Q3. Consider the grammar

$S \rightarrow 0S | 1S | 0A$

$A \rightarrow 0$

Q3(a) The grammar is a

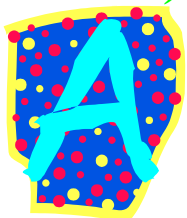
*a) regular grammar b) context free grammar c)
context sensitive grammar d) unrestricted grammar*



Answer: A

Q3(b) The language generated by the grammar is

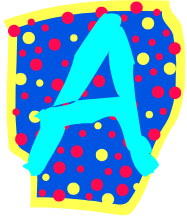
- a) all strings over $\{0,1\}$*
- b) set of all strings ending in 00*
- c) set of all strings ending in 0*
- d) set of all strings not containing 100*



Answer:B

Q3(c) The minimal dfa accepting the set generated by the grammar has

- a) 3 states B)4 states c) 5 states d) 6 states*



Answer:A

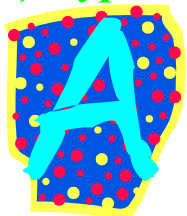
Q4. Consider the grammar G

$S \rightarrow bSb | aSa | \epsilon | a | b$

Two rules are added to the grammar $S \rightarrow aS$ and $S \rightarrow bS$ to obtain the grammar G1

Q4(a) The grammar G is

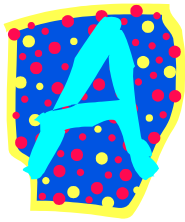
- a) Type 0 b) Type 1 c) Type 2 d) Type 3*



Answer:D

Q4(b) The language generated by the grammar G is

- a) regular and $(0+1)^*$*
b) finite
c) context-free but not regular
d) the set of all palidromes over $\{a,b\}$



Answer:D

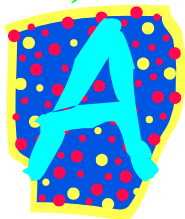
Q4(c) The language generated by the grammar G1 is

e) regular and $(0+1)^$*

f) finite

g) context-free but not regular

h) the set of all palidromes over $\{a,b\}$



Answer:E

Q5. Consider the grammar $G=(\{S\},\{a,b\},P1,S)$ where P1 is given by

$S \rightarrow aSbS | bSaS | \epsilon$

And the grammar $G1=(\{S,A,B\},\{a,b\},P2,S)$ where P2 is given by

$S \rightarrow aB | bA$

$A \rightarrow a | aS | bAA$

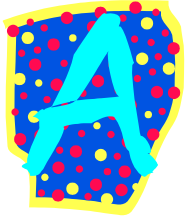
$B \rightarrow b | bS | aBB$

Let L1 be the language generated by G and L2 be the language generated by G1.

Q5(a) Choose the correct statement

A) $L1=L2$ B) $L2$ is a subset of $L1$ C) $L1$ is a subset of $L2$

D) $L1$ and $L2$ are incomparable



Answer: B

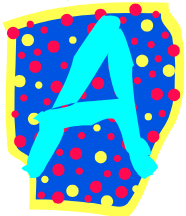
Q5(b) The sets generated $L1$ and $L2$ are

a) the set of all strings over $\{a,b\}$ with an equal number of a's and b's

b) the set of all strings over $\{a,b\}$ with an equal number of a's and b's only $L2$ does not generate the empty string

c) the set of all strings over $\{a,b\}$ with more a's than b's

d) the set of all strings over $\{a,b\}$ with more b's than a's



Answer: (B)

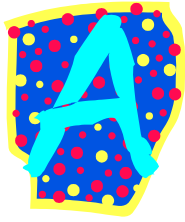
Q5 (c) Choose the correct statement

A) G and $G1$ are ambiguous

B) $G1$ is ambiguous but G is not

C) G is ambiguous but $G1$ is not

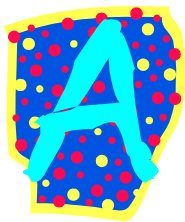
D) Neither G nor $G1$ is ambiguous



Answer(A)

Q5(d) Choose the correct statement

- A) The grammars generated by G and G1 are both inherently ambiguous*
- B) G generates an inherently ambiguous language but G1 does not*
- C) G1 generates an inherently ambiguous language but G does not*
- D) Both generate unambiguous languages*



Answer: (D)

Q6. Consider the grammar $G = (\{S\}, \{a, b\}, P1, S)$ where P1 is given by

$S \rightarrow aSbSaS \mid aSaSbS \mid bSaSaS \mid \epsilon$

And the grammar $G1 = (\{S, A, B\}, \{a, b\}, P2, S)$ where P2 is given by

$S \rightarrow a A1 B \mid a B A1 \mid b A2$

$A1 \rightarrow a | a S | b A2$

$A2 \rightarrow a A1 | b A2 A2$

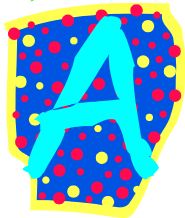
$B \rightarrow b | b S | a A1 B B | a B A1 B$

Let $L1$ be the language generated by G and $L2$ be the language generated by $G1$.

Q6(a) Choose the correct statement

A) $L1=L2$ B) $L2$ is a subset of $L1$ C) $L1$ is a subset of $L2$

D) $L1$ and $L2$ are incomparable



Answer: B

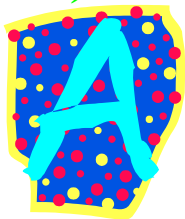
Q6(b) The sets generated $L1$ and $L2$ are

e) the set of all strings over $\{a,b\}$ with twice as many a 's as b 's

f) the set of all strings over $\{a,b\}$ with twice as many a 's as b 's only $L2$ does not generate the empty string

g) the set of all strings over $\{a,b\}$ with more a 's than b 's

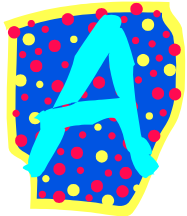
h) the set of all strings over $\{a,b\}$ with more b 's than a 's



Answer: (f)

Q6(c) Choose the correct statement

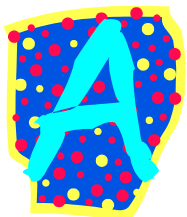
- E) G and G1 are ambiguous*
- F) G1 is ambiguous but G is not*
- G) G is ambiguous but G1 is not*
- H) Neither G nor G1 is ambiguous*



Answer(e)

Q6(d) Choose the correct statement

- E) The grammars generated by G and G1 are both inherently ambiguous*
- F) G generates an inherently ambiguous language but G1 does not*
- G) G1 generates an inherently ambiguous language but G does not*
- H) Both generate unambiguous languages*



Answer: (h)

Q7. Consider the following grammar G

$S \rightarrow PQR$

$P \rightarrow aP|a$

$Q \rightarrow bP|b$
 $R \rightarrow vR|c$

Consider the grammar $G1$

$S \rightarrow aPQR$

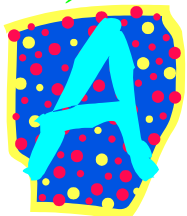
$P \rightarrow aP|a$

$Q \rightarrow bQ|b$

$R \rightarrow cR|c$

Q7(a) The set generated by the grammars are

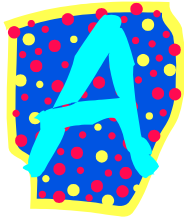
- a) Type 3*
- b) cfl but not regular*
- b) csl but not regular*
- c) r.e but not a cfl*



Answer(A)

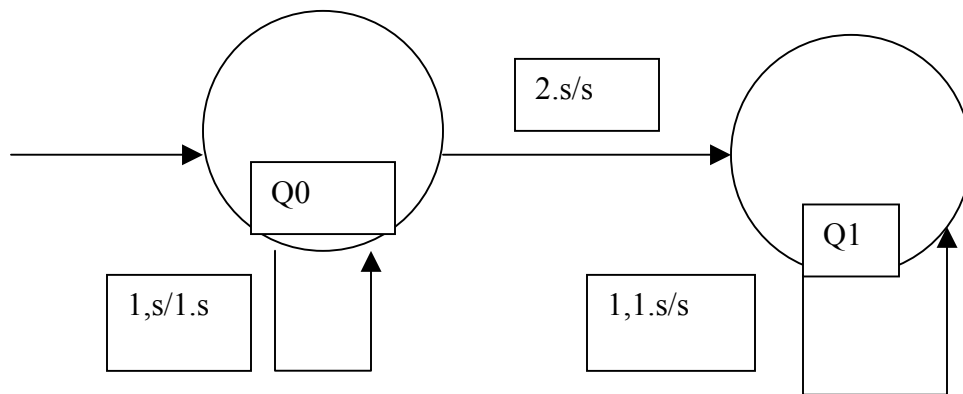
Q7(b) The set generated by the grammars G and $G1$

- a) are inherently ambiguous*
- b) are not inherently ambiguous*
- c) The language generated by G is not inherently ambiguous but the one generated by $G1$ is*
- d) The language generated by $G1$ is not inherently ambiguous but the one generated by G is*



Answer(B)

Q8. A push down automaton(pda) is given in the following extended notation of finite state diagrams

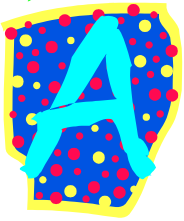


The nodes denote the states while the edges denote the moves of the pda. The edge labels are of the form $d.s/s'$ where d is the input symbol read and $s.s'$ are the stack contents before and after the move. For example, the edge labeled $1,s/1.s$ denotes the move from state $Q0$ to $Q0$ in which the input symbol 1 is read and pushed to the stack.

Q8(a) Two edges that should be added to the pda to accept $\{w^2wR \mid w \text{ in } (0+1)^ \text{ and } wR \text{ is the reversal of } w\}$ by empty stack are*



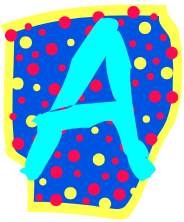
- A) $\delta(Q_0, 0, s/2.s)$ and $\delta(Q_1, 0, 2.s/s)$*
- B) $\delta(Q_0, 0, 2.s/s)$ and $\delta(Q_1, 0, 2.s/s)$*
- C) $\delta(Q_0, 0, 2.s/2.s)$ and $\delta(Q_1, 2, 2.s/s)$*
- D) None of the above*



Answer: (A)

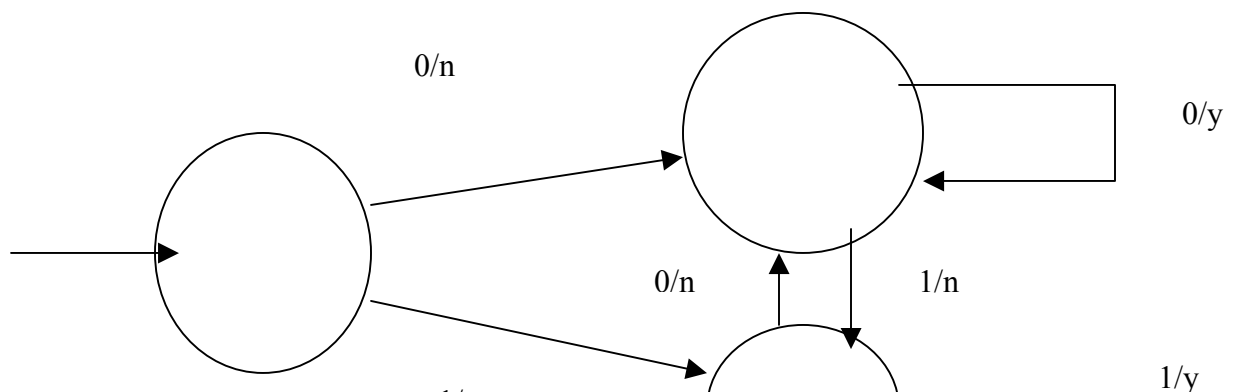
Q8(b) An edge that should be added to the pda to accept $\{1^m 2 1^n \mid m \leq n \leq 2m, m, n \geq 1\}$ is

- A) $\delta(Q_0, 1, s/11s)$ B) $\delta(Q_0, 2, s/22s)$ C) $\delta(Q_1, 1, s/11s)$ D) None of the above*



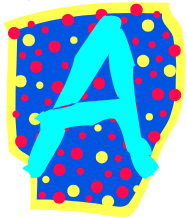
Answer(A)

Q9. Consider the Mealy machine given below



The Mealy machine recognises strings when it has the output y.

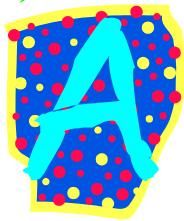
Q9(a) The set recognised by the Mealy machine model is
A) $(0+1)^*(00+11)$ B) all even number of 0's and 1's
C) all odd number of 0's and 1's D) None of the above



Answer: (A)

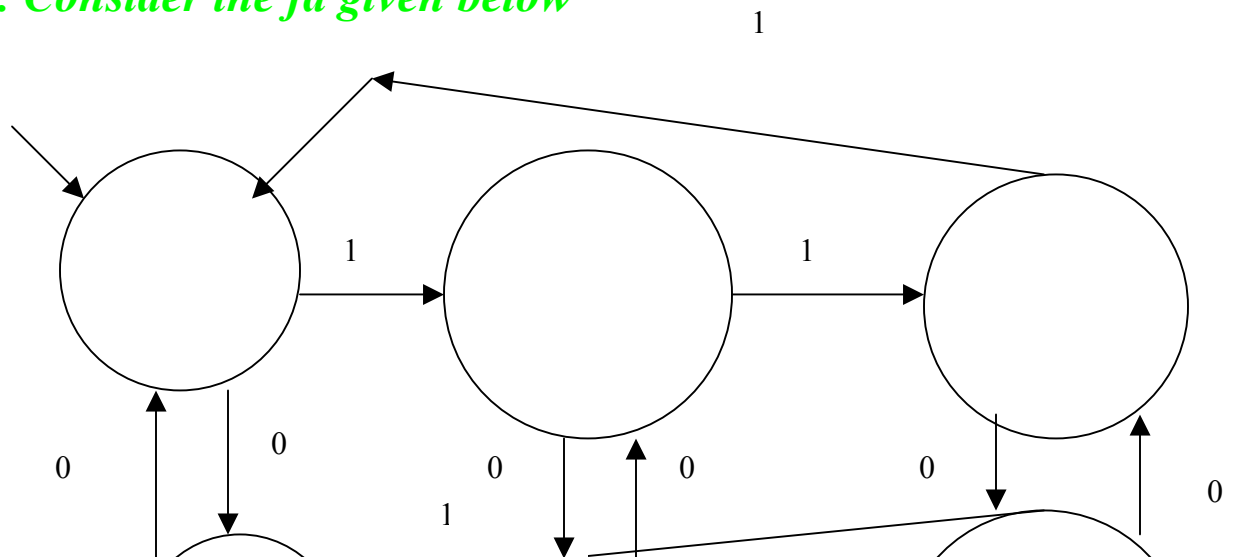
Q9(b) The minimal dfa accepting the set recognised by the Mealy machine has

a) 3 states b) 4 states c) 5 states d) 6 states



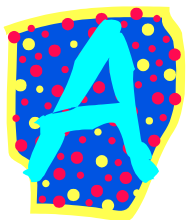
Answer: (C)

Q10. Consider the fa given below



Q10(A) The set accepted by the fa is the set of strings over $\{0,1\}$ where the 1's and 0's are

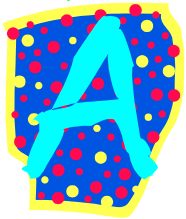
A) divisible by 3 and 2 B) odd and even C) even and odd D) divisible by 2 and 3



Answer (A)

Q10(B) The minimal dfa equivalent to the above fa has

a) 4 states b) 5 states c) 6states d) 3 states



Answer (C)

Q11. Consider the grammar G1

$E \rightarrow E+E | E * E | (E) | I$

And the grammar G2

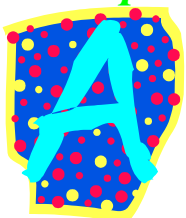
$E \rightarrow E+T | T$

$T \rightarrow T * F | F$

$F \rightarrow (E) | I$

Q11(a) The grammars generate the languages L1 and L2 respectively

A) $L1=L2$ B) $L1 \subseteq L2$ C) $L1 \supseteq L2$ D) L1 and L2 are incomparable



Answer: (A)

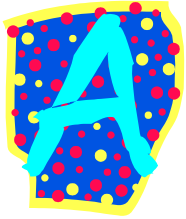
Q11(b) The grammars G1 and G2

a) are both ambiguous

b) G1 is ambiguous but G2 is not

c) G2 is ambiguous but G1 is not

d) Both are unambiguous



Answer(B)

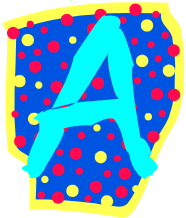
Q11(c) The languages L1 and L2

e) are both inherently ambiguous

f) L1 is inherently ambiguous but L2 is not

g) L2 is inherently ambiguous but L1 is not

h) Both are not inherently ambiguous



Answer(H)

Q12. Consider the grammar G1

$E \rightarrow E+E | E.E | E^ | a | b | \varepsilon | \varnothing$*

And the grammar G2

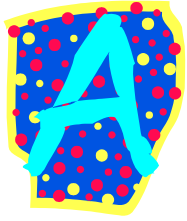
$E \rightarrow E+T | T$

$T \rightarrow T.F | F$

$F \rightarrow E^ | (E) | a | b | \varnothing | \varepsilon$*

Q12(a) The grammars generate the languages L1 and L2 respectively

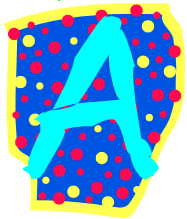
A) $L1=L2$ B) $L1 \subseteq L2$ C) $L1 \supseteq L2$ D) $L1$ and $L2$ are incomparable



Answer: (A)

Q12(b) The grammars $G1$ and $G2$

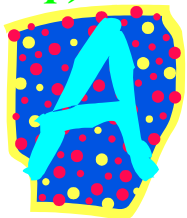
- i) are both ambiguous*
- j) $G1$ is ambiguous but $G2$ is not*
- k) $G2$ is ambiguous but $G1$ is not*
- l) Both are unambiguous*



Answer(J)

Q12(c) The languages $L1$ and $L2$

- m) are both inherently ambiguous*
- n) $L1$ is inherently ambiguous but $L2$ is not*
- o) $L2$ is inherently ambiguous but $L1$ is not*
- p) Both are are not inherently ambiguous*



Answer(P)



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