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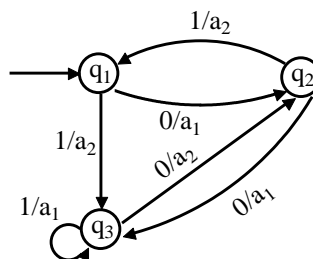
- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.

1. a) Explain Chomsky Hierarchy in detail. 6
b) Prove the following using method of induction. 7

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}.$$

OR

2. a) Let $R = \{(1,2), (2,3), (3,1)\}$ & $A = \{1,2,3\}$. Find Reflexive, symmetric & transitive closure of R . 4
b) Define : 3
i) Kleene closure ii) Positive closure
with an example.
c) Explain pigeon-hole principle in detail. 6
3. a) Construct a DFA over $\Sigma = \{0,1\}$ for the "Language accepting 1100 or 1010 as a substring". 7
b) Convert following mealy machine into equivalent Moore machine. 6



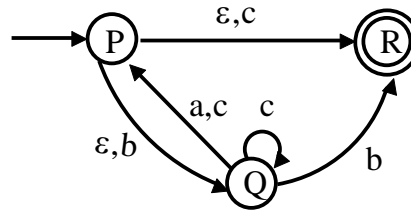
OR

4. a) Construct DFA equivalent to : 6
 $M = (\{q_0, q_1, q_2\}, \{a, b\}, \delta, q_0, \{q_2\})$
Where δ is defined by its state table.

State	Input	
	a	b
$\rightarrow q_0$	$\{q_0, q_1\}$	$\{q_2\}$
q_1	$\{q_0\}$	$\{q_1\}$
q_2	--	$\{q_0, q_1\}$

b) Convert the NFA with ϵ -transition to NFA without ϵ -transition.

7



5. a) What is Regular Grammar? Find left linear and right linear grammar for the following regular expression.

8

i) $(0+1)^* 00 (0+1)^*$

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

b) Convert the following grammar into CNF

6

$S \rightarrow ABa$

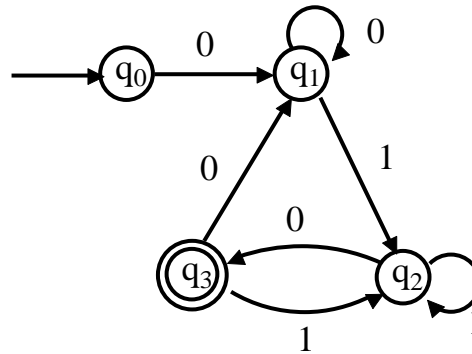
$A \rightarrow aab$

$B \rightarrow Ab$

OR

6. a) Find Regular expression for following transition diagram.

7



b) Explain closures properties of Regular set.

7

7. a) Design PDA for the language

7

$L = \{ \omega \subset \omega^R \mid \omega \in (0+1)^* \}$.

R : Reverse string.

b) Explain the modal of PDA and its acceptance by stack and acceptance by final state.

6

OR

8. a) Explain pumping lemma theorem for context free language.

6

b) Convert following CFG into PDA.

7

$E \rightarrow aAB \mid d$

$A \rightarrow BA \mid a$

$B \rightarrow Ead \mid c$

9. a) Design a Turing machine for the language 8
 $L = \{WW^R \mid W \in (0+1)^*\}$
R : Reverse string.
- b) Explain the modal of linear bounded automata. 6

OR

10. a) Explain : Turing machine as transducers with example. 7
- b) Design a Turing machine that computes the function $f(m,n) = m + n$. 7
11. a) What is Ackermann's function, calculate A (1, 1) A (1, 2) A (2, 1). 6
- b) Explain the properties of Recursively enumerable language. Give relation between recursive & recursive enumerable language. 7

OR

12. a) What is significance of PCP, solve the following using PCP. 7
 $A = \{b, bab^3, ba\}$ $B = \{b^3, ba, a\}$.
- b) Write a short note on LBA. 6



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The secret of getting ahead is getting started.

~ Mark Twain

