



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – MATHEMATICS

SECOND SEMESTER – APRIL 2017

16PMT2ES01- FORMAL LANGUAGES AND AUTOMATA THEORY

Date: 28-04-2017
TIME 01:00-04:00

Dept. No.

Max. : 100 Marks

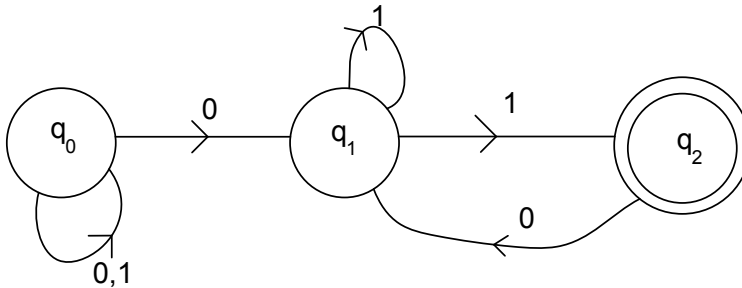
Answer **ALL** questions:

1. (a) Construct a DFA to accept the Automata M such that $T(M) = \{a^n b^m, m, n \geq 1\}$ (5)

(OR)

- (b) Define non-deterministic finite Automaton and hence construct an NFA to accept the set of all strings over $\{0,1\}$ with 00. (5)

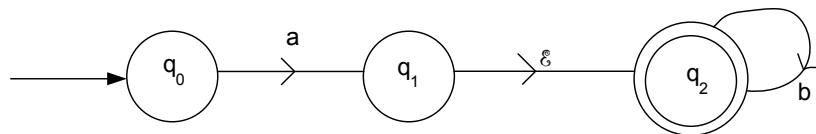
- (c) Construct an equivalent DFA to the following NFA.



(15)

(OR)

- (d) Convert the following NFA with ϵ to NFA without ϵ .



(15)

2. (a) If L_1 and L_2 are two regular languages then prove that $L_1 - L_2$ is also regular. (5)

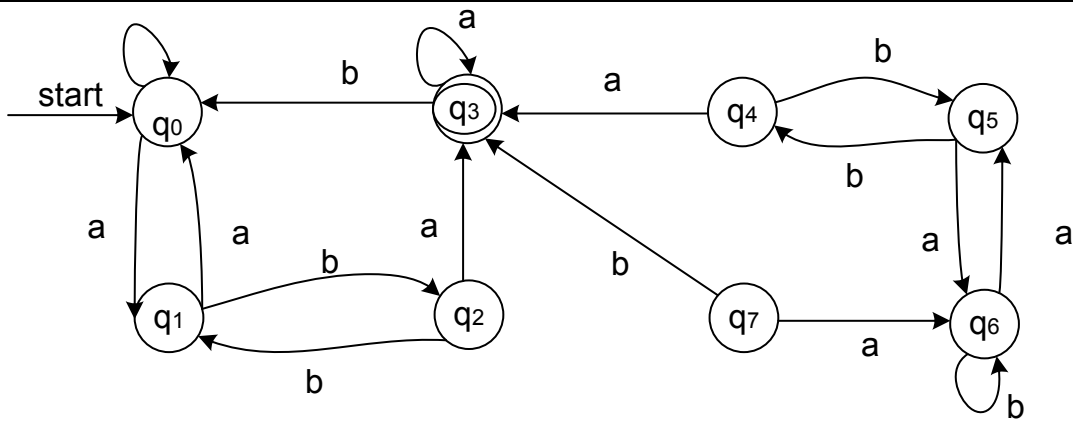
(OR)

- (b) State pumping lemma and write down its advantages. (5)

- (c) Construct NFA for the regular expression $b + ba^*$. (15)

(OR)

- (d) Construct the minimum state automaton for the following transition diagram.



(15)

3. (a) Define ambiguity? If G is the grammar $S \rightarrow SbS/a$. Show that G is ambiguous. (5)

(OR)

(b) Explain Chomsky's Normal Form. (5)

(c) (i) Convert the following CFG into CNF.

$$S \rightarrow aaaaS$$

$$S \rightarrow aaaa.$$

(ii) Construct the derivation tree for the string $aabbabba$ from the CFG given by $s \rightarrow aB \setminus bA$

$$A \rightarrow a \setminus aS \setminus bAA$$

$$B \rightarrow b \setminus bS \setminus aBB$$

(7+8)

(OR)

(d) (i) Construct a grammar to generate set of all palindromes.

$L\{a, b, aba, aabaa, bab, baab, bbabb, \dots\}$ and generate the following by using the production rules (i) $abbbba$ (ii) $baaaaaab$.

(ii) Define Derivation tree and write down its properties. (9+6)

4. (a) Define Pushdown Automata and draw the different symbols used for the pushdown automata. (5)

(OR)

(b) Explain the Languages on Pushdown Automata. (5)

© Build a PDA for the Language $L = \{0^n 1^m 0^n / m, n \geq 1\}$ by empty stack. Trace your PDA for the input with $n = 2$ and $m = 3$. (15)

(OR)

(d) Design a PDA for the language $L = \{a^n b^n / n \geq 1\}$. (15)

5.(a) Write the definition and features of Turing machine. (5)

(OR)

(b) Construct a Turing machine for concatenation of the two strings of unary numbers. (5)

© Construct a Turing machine for checking the palindrome of the string of even length. (15)

(OR)

(d) Construct PDA for the following grammar. $S \rightarrow AB, A \rightarrow CD, B \rightarrow b, C \rightarrow a, D \rightarrow a$.

(15)

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