

Printed Pages : 4



EIT-072

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 113752

Roll No.

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B. Tech.(SEM. VII) (ODD SEM.) THEORY
EXAMINATION, 2014-15**THEORY OF AUTOMATA & FORMAL LANGUAGES**

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Attempt **all** questions.
 - (2) Assume suitable notations wherever necessary.

1 Attempt any two parts of the following : $2 \times 10 = 20$

- (a) If $M = (\{P, Q, R, S\}, \{0, 1\}, \partial, P, \{Q, S\})$
and the transition table is given as :

<i>States / input</i>	0	1
$- > P$	Q, S	Q
$Q +$	R	R, S
R	S	P
$S +$	$-$	P

Construct a DFA equivalent to the given
NFA.

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- (b) Construct a Minimum state automation equivalent to the given DFA :

States / input	0	1
- > q ₀	q ₁	q ₂
q ₁	q ₄	q ₃
q ₂	q ₄	q ₃
q ₃ +	q ₅	q ₆
q ₄ +	q ₇	q ₆
q ₅	q ₃	q ₆
q ₆	q ₆	q ₆
q ₇	q ₄	q ₆

- (c) Construct a DFA accepting all the numbers over {0,1,.....,8,9} which are divisible by 3. Also verify your designed machine.

2 Attempt any two parts of the following : **2×10=20**

- (a) (i) State and prove Arden's theorem.
 (ii) Prove

$$(1 + 00^*1) + (1 + 00^*1)(0 + 10^*1)^*(0 + 10^*1) = 0^*1(0 + 10^*1)^*$$

- (b) Construct a DFA with reduced states equivalent to the R.E. $10 + ((0+11)0^*1)$.

- (c) State and prove pumping lemma for regular set, also show that $L = \{a^p / p \text{ is a prime}\}$ is not regular.

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3 Attempt any **two** parts of the following : $2 \times 10 = 20$

- (a) Describe both the lemmas used to convert a Context Free Grammar into Greibach Normal Form.
- (b) Convert the given CFG into Chomsky Normal Form (CNF) :

$$S \rightarrow AB / aB$$

$$A \rightarrow aab / \epsilon$$

$$B \rightarrow bbA$$

- (c) Find the reduced grammar equivalent to the grammar G whose productions are :

$$S \rightarrow AB / CA$$

$$B \rightarrow BC / AB$$

$$A \rightarrow a$$

$$C \rightarrow aB / b$$

4 Attempt any **two** parts of the following : $2 \times 10 = 20$

- (a) Consider the language of all balanced strings involving two types of brackets : { } and []. Construct the PDA for the above language.

- (b) Construct the PDA for :

$$\{ WW^T / W \in (a + b)^* \}$$

- (c) Consider the given

$$PDA : M = (\{q_0\}, \{0, 1\}, \{a, b, Z_0\}, \delta, q_0, Z_0, \phi)$$

Where δ is defined as follows :

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$$\delta(q_0, 0, Z_0) = \{(q_0, aZ_0)\}$$

$$\delta(q_0, 1, Z_0) = \{(q_0, bZ_0)\}$$

$$\delta(q_0, 1, b) = \{(q_0, bb)\}$$

$$\delta(q_0, \epsilon, Z_0) = \{(q_0, \epsilon)\}$$

Convert the given PDA M to corresponding CFG.

5 Attempt any **two** parts of the following : **2×10=20**

- (a) Write post correspondence problem. Differentiate it with modified PCP. Does the PCP with two lists $x=(1,10,1011)$ and $y=(111,101,10101)$ have a solution. Explain.
- (b) What is recursive and recursive enumerable languages ? Prove that L is recursive iff L and its complement L^c are both Recursive Enumerable ?
- (c) Design a Turing Machine for

$$L = \{a^i b^j / i \geq j\}$$

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