

(Following Paper ID and Roll No. to be filled in your Answer Books)	
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B.TECH.

Theory Examination (Semester-IV) 2015-16

**THEORY OF AUTOMATA AND
FORMAL LAUNGUAGE**

Time : 3 Hours

Max. Marks : 100

Section-A

Q.1 Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

- (a) Design a FA to accept the string that always ends with 00.
- (b) Differentiate between the L^* and L^+ .
- (c) Write regular expression for set of all strings such that number of 0's is odd.
- (d) What is a Moore and Mealy machine?

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(1)

P.T.O.

- (e) Construct the CFG for the regular expression $(0+1)^*$.
- (f) What are the features of universal Turing machine?
- (g) Define the languages generated by Turing machine.
- (h) Describe the instantaneous description of a PDA.
- (i) Design a DFA to accept the binary number divisible by 3.
- (j) What do you understand by Epsilon-closure of state in finite automata?

Section-B

2. Attempt any five parts. All parts carry equal marks: (5×10=50)

- a. Construct a NFA for the language L which accept all the strings in which the third symbol from right end is always an over $\Sigma = \{a, b\}$.
- b. State and Prove Pumping Lemma of RE. Show that $L = \{a^p : p \text{ is prime}\}$ is not regular?
- c. Explain the parse tree with an example. Reduce the context free grammar into GNF whose productions are $S \rightarrow aSb$, $S \rightarrow ab$.

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- d. Define Pushdown automata. Differentiate PDA by empty stack and final state by giving their definitions.
- e. Obtain PDA to accept all strings generated by the language $\{a^n b^m a^n, m, n \geq 1\}$.
- f. Construct DFA equivalent to NFA. where δ is defined in the following table: 1

Q	$\delta(q,a)$	$\delta(q,b)$
A	A,B	C
B	A	B
C*(final state)	-	A,B

Table: 1

- g. Consider the CFG $(\{S, A, B\}, \{a, b\}, P, S)$ where productions are as follows:
- $S \rightarrow aABB / aAA, A \rightarrow aBB / a, B \rightarrow bBB / A$. Convert the given grammar to PDA that accept the same language by empty stack.
- h. Design CFG for the language consisting of all strings of even length over $\{a, b\}$.

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(3)

P.T.O.

Section-C

Note: Attempt any two questions from this section.

(2×15=30)

3. Write short notes on the following:
- Halting Problem
 - Church's thesis
 - Recursively enumerable language
4. What is Chomsky hierarchy? Explain post correspondence problem.
5. Construct a Turing machine which accepts the regular expression, $L = \{0^n 1^n | n \geq 1\}$.

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(4)

P.T.O.