

B.TECH. SEM -V (COMPUTER) 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT: FORMAL LANGUAGES & AUTOMATA THEORY

Day: **Thursday**
Date: **11/01/2018**

W-2017-2126

Time: **02.30 PM TO 05.30 PM**
Max. Marks: **60**

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat diagrams **WHEREVER** necessary.
- 4) Assume suitable data if necessary.

Q.1 a) Construct the NFA and DFA for the following language: **(05)**

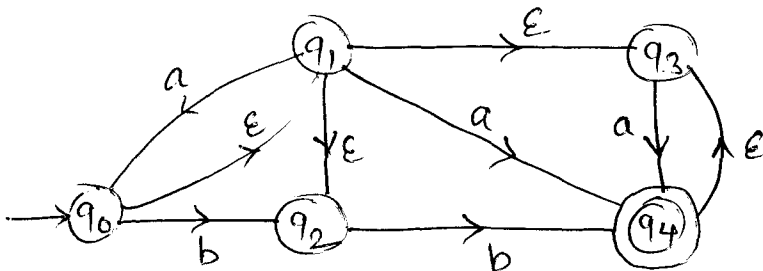
- i) $L = \{x \in \{0,1\}^* : X \text{ is starting with 1 and } |X| \text{ is divisible by 3.}$
- ii) $L = \{x \in \{a,b\}^* : X \text{ contains any number of } a' \text{ s followed by at least one b}\}$

b) Convert to DFA the following NFA. **(05)**

	0	1
→{p}	{q,s}	{q}
q*	{ r }	{q, r}
r	{ s }	{p}
s*	ϕ	{p}

OR

Q.1 a) Find an equivalent DFA for the following ϵ -NFA **(05)**



b) Design DFA and NFA for accepting a set of strings over alphabet $\{0, 1\}$ which accepts even numbers of 0's and odd number of 1's. **(05)**

Q.2 a) Construct mealy machine that accept strings ending in 11 and 00, convert the same to moore machine. **(05)**

b) Using pumping lemma for regular sets. Prove that the language: $L = \{a^m b^n \mid m > n\}$ is not regular. **(05)**

OR

Q.2 a) Draw a finite automata recognizing the corresponding languages: **(05)**

- i) $(010+00)^* + (10)$
- ii) $1(1+10)^* + 10(0+01)^*$

b) Design a mealy machine for incrementing the value of any binary number of one. The output should also be binary number with value one more than the number given. **(05)**

P. T. O.

- Q.3 a)** Eliminate unit productions from **(05)**
 $P = S \rightarrow ABA \mid BA \mid AA \mid AB \mid A \mid B$
 $A \rightarrow aA \mid a$
 $B \rightarrow bB \mid b$
- b)** Give the GNF for the following CFG. **(05)**
 $S \rightarrow AB$
 $A \rightarrow BS \mid b$
 $B \rightarrow SA \mid a$

OR

- Q.3 a)** What is useless symbol in grammar? **(05)**
 Remove the useless symbol from following grammar
 $G = (\{S, A, B\}, \{a\}, P, S)$
 P consist of
 $S \rightarrow AB \mid a$
 $A \rightarrow a$
- b)** For the grammar given below **(05)**
 $S \rightarrow A1B$
 $A \rightarrow 0A \mid \epsilon$
 $B \rightarrow 0B \mid 1B \mid \epsilon$
 Give parse tree for leftmost and rightmost of the string 1001.

- Q.4 a)** Design PDA to check whether a given string over $\{a, b\}$ ends in abb. **(05)**
b) Construct the PDA that accept language generated by CFG **(05)**
 $S \rightarrow SS \mid (S) \mid ()$

OR

- Q.4 a)** Find the PDA for given grammar **(05)**
 $S \rightarrow 0S1 \mid 00 \mid 11$
- b)** Design a PDA for following language **(05)**
 $L = \{X, aXa, bXb, aaXaa, abXba, bbXbb, aaXaa, aaaXaaa\}$

- Q.5 a)** Design turing machine to replace string 110 by 101 in binary input string. **(05)**
b) Construct TM for checking well formedness of parentheses. **(05)**

OR

- Q.5 a)** Design a TM to find 2's complement of binary machine. **(05)**
b) Design a TM to reverse a string $\Sigma = \{a, b\}$. **(05)**

- Q.6 a)** Write down in detail use and applications of universal turing machine. **(05)**
b) Write short notes on: **(05)**
 i) Text Editor ii) Searching using RE

OR

- Q.6 a)** State the features of CFG and explain CFG in detail. **(05)**
b) Explain RE and FA in detail with the help of its real life applications. **(05)**

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