B.E. Computer Science & Engineering (Model Curriculum) Sem-V
TEE103CS - Formal Language and Automata Theory

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Notes :   1.   All questions are compulsory.
          2.   All questions carry equal marks.
          3.   Assume suitable data wherever necessary.

1.   a)   Design a DFA and write all 5-tuples of each, for the following languages.   **8**

          i) $L = \{a^m b^n ;$ where $m >= 0$ and $n >= 1\}$

          ii) $L = \{a^m b^n c^k ;$ where $m >= 0$, $n >= 1$ and $k >= 1\}$

         b)   Convert the following NFA into its equivalent DFA.   **8**

Q/Σ	0	1
→p	p	p, q
*q	r	r
r	-	s
*s	s	s

<div align="center">OR</div>

2.   a)   Design a DFA to accept all the natural numbers divisible by 3.   **8**

         b)   Minimize the following DFA by pair table method.   **8**
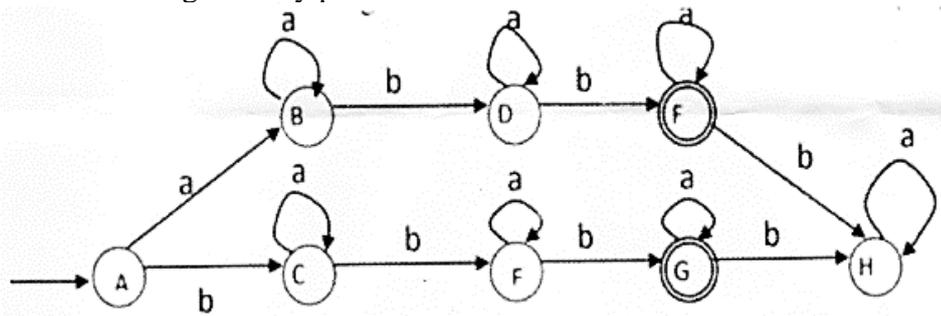

3.   a)   Design a minimize DFA for the Regular Expression = a*b*c*.   **8**

         b)   What do you mean by ambiguous grammar. Check the following grammar is ambiguous   **8**
              or not. If it is an ambiguous grammar then remove the ambiguity.
                  $E \rightarrow E+E \mid E*E \mid id$

<div align="center">OR</div>

4.   a)   Discuss Arden's Theorem and Construct regular expression for the following automata.   **8**
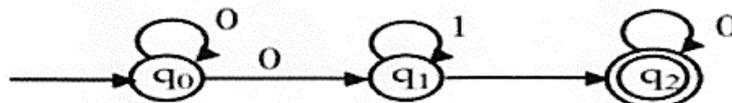
b) Construct the left-most and right-most derivations for the following grammar **8**
$S \rightarrow aB \mid bA$

$A \rightarrow aS \mid bAA \mid a$

$B \rightarrow bS \mid aBB \mid b$

which accepts the string "aaabbabbba".

5. a) Construct PDA for the language $L = \{WcW^R \mid W \in \{a, b\}*\}$ R : Reverse string. **8**

b) Consider the following Context Sensitive Grammar **8**
$S \rightarrow abc \mid aAbc$

$Ab \rightarrow bA$

$Ac \rightarrow Bbcc$

$bB \rightarrow Bb$

$aB \rightarrow aa \mid aaA$

What is the language generated by this grammar?

OR

6. a) Explain Context Sensitive Grammar. Describe the working of Linear Bounded Automata in brief. **8**

b) Discuss the limitation of PDA and prove that how can we overcome those Limitation by LBA with the help of following language. **8**
$L = \{a^n b^n c^n; \text{ where } n >= 1\}$

7. a) Design a TM to perform addition of two unary number. **8**

b) Write short note on **any two.** **8**
i) Counter machine. ii) Multi-tape TM.
iii) Offline TM. iv) Multidimensional TM.

OR

8. a) Design a TM for the following language. **8**
$L = \{a^m b^n c^m; \text{ where } m \text{ and } n >= 1\}$

b) Describe the working of Turing Machine and prove that "Turing Machine is most powerful machine amongst all automatas." **8**

9. a) Consider PCP system that described by the following test. **8**
$A = \{10, 01, 0, 100, 1\}$ and $B = \{101, 100, 10, 0, 010\}$
Does this PCP have solution?

b) Define Ackermann's function; **8**
Compute A (2, 1) and A (2, 2).

OR

10. Write short note on:

i) Universal Turing Machine. **6**

ii) Church's Hypothesis. **5**

iii) Rice's Theorem. **5**

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