

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

P. Pages : 2

Time : Three Hours

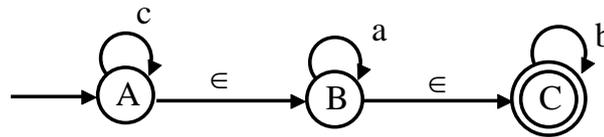


**GUG/W/23/13813**

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Convert the given NFA -  $\epsilon$  to NFA without  $\epsilon$  8

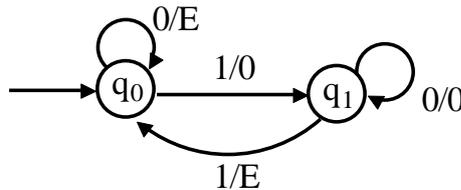


- b) Construct DFA for the following language  $L = \{w / w \in \{1,0\}^+\}$ ,  $w$  is a string which starts with "110" 8

**OR**

2. a) Construct DFA for the language over  $\Sigma = \{a, b\}$  for the set of all strings which starts with substring "bb". 8

- b) Convert the following Mealy machine to Moore machine. 8



3. a) Show that the given set is non-regular using pumping lemma for regular language 8

- i)  $L = \{0^{2n} 1^n \mid n \geq 1\}$
- ii)  $L = \{a^n b^n c^m d^m \mid m, n \geq 1\}$

- b) Construct DFA for the regular expression. 8

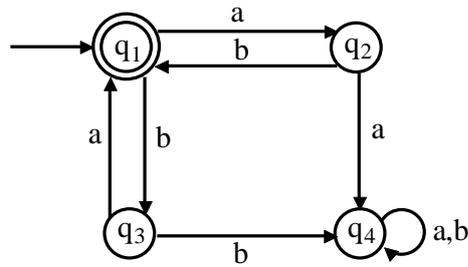
- i)  $(0+1)(0+1)^*$
- ii)  $(01+10)(1+0)^*$

**OR**

4. a) Describe pumping lemma for a regular language with example. 8

$$L = \{a^P \mid P \text{ is prime}\}$$

- b) Convert the given Finite Automata into its equivalent regular expression. 8



5. a) Define and design PDA for 8  
 $L = \{a^p b^q c^m / p + m = q, m, p \geq 1\}$
- b) For a given grammar, derive the following string “aabb” using Leftmost and right most derivation. 8  
 $S \rightarrow aSb \mid \epsilon$

**OR**

6. a) Design PDA for the language 8  
 $L = \{W \subset W^R / W \in \{0,1\}^*\}$
- b) Identify and remove unit productions. 8
- |  |  |
|--|--|
| i) $S \rightarrow S + T / T$<br>$T \rightarrow T * F / F$<br>$F \rightarrow (S) / a$ | ii) $S \rightarrow A / bb$<br>$A \rightarrow B / b$<br>$B \rightarrow a$ |
|--|--|

7. a) Define Turing Machine Construct TM for the 2’s complement. 8
- b) Convert the following CFG to Greibach Normal Form 8  
 $S \rightarrow AB$   
 $A \rightarrow BSB / BB / b$   
 $B \rightarrow a$

**OR**

8. a) Design Turing Machine for the given language 8  
 $L = \{a^n b^n c^n \mid n \geq 1\}$
- b) Convert following grammar into CNF 8  
 $S \rightarrow aaaaS / aaaa$
9. a) Describe Chomsky Hierarchy. 8
- b) Explain recursive and recursively enumerable languages. 8

**OR**

10. a) Write a short note on multitrack Turing Machine. 8
- b) Define and explain Halting problem of TM. 8

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