



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

PAPER ID : 110404

Roll No.

B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15
THEORY OF COMPUTATION

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions. All questions carry equal marks.

1 Attempt any four parts of the following. **5x4=20**

- (a) Describe the language expressed by regular expression $(0^*1^*)^*$.
- (b) What is a DFA? Compute the language of a DFA.
- (c) Prove that the language of DFA and NFA are same. Justify your answer with an example.
- (d) Consider the following NFA with E-moves,

State	Input Symbol			Null String (ϵ)
	1	2	3	
$\rightarrow q_0$	q_0	-	-	q_1
q_1	-	q_1	-	q_2
$*q_2$	-	-	q_3	-

Compute δ head $(q_0, 1)$, δ -head $(q_0, 2)$ and δ -head $(q_3, 3)$.

- (e) Construct the DFA from given NFA with ϵ -moves.
- (f) Describe the language accepted by the DFA constructed above.

2 Attempt any two parts of the following. **10x2=20**

- (a) What is a regular expression? Construct a DFA for the regular expression $(00^*+11^*)^*$.
- (b) Let $\Sigma = \{0,1\}$, then prove that $L = \{0^i, 1^j \mid j \text{ is a multiple of } i\}$ is not regular.
- (c) Prove that complement of a regular language is closed.

3 Attempt any two parts of the following. **(10x2=20)**

- (a) Construct the context free language (CFL) for the language $\{a^n c b^n \mid n \geq 0\}$.
- (b) Show that the language $L = \{0^n 1^m \mid m = n^2\}$ is not a CFL.
- (c) Write short notes on the following.
 - (i) Decidable problems of CFL.
 - (ii) Undecidable problems of CFL.

4 Attempt any two parts of the following. **10x2=20**

(a) Construct the PDA for the language $L = \{wcw^R \mid w \text{ in } \{a, b\}^*\}$, where R stands for reverse string.

(b) Convert CFG into GNF

$$S \rightarrow AA \mid 0$$

$$A \rightarrow SS \mid 1$$

(c) Convert the following grammar into CNF.

$$S \rightarrow aB \mid bA$$

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

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

5 Attempt any two parts of the following. **10x2=20**

(a) Define a Turing machine. Draw the transition diagram for a Turing machine accepting the language.

$$L = \{www \mid w \text{ in } \{a, b\}^*\}$$

(b) Show that if L_1 and L_2 are recursive language, then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursive.

(c) Write short notes on any one:

(a) Halting problem

(b) Universal Turing machine.