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CS404

(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
	1	2	3	(ε)
$\rightarrow q_0$	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 $(q_3, 3)$.

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(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 $\sum = \{0,1\}$, then prove that $L=\{0^i, 1\ 1^j\}$ | j 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.

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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.

$S \rightarrow aB \mid bA$

$A \rightarrow a\ S|a|bAA$

$B \rightarrow b\ S|b|aBB$

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 $L_1 \cup L2$ and $L_1 \cap L_2$ are also recursive.

(c) Write short notes on any one:

(a) Halting problem

(b) Universal Turing machine.

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