BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-III Computer Science & Business Systems : WINTER: 2025
SUBJECT: FORMAL LANGUAGE & AUTOMATA THEORY

Day : Tuesday | Time : 10:00 AM-01:00 PM
Date : 09/12/2025 | **W-29213-2025** | Max. Marks : 60

NB :
1. All questions are COMPULSORY.
2. Figures to the right indicate FULL marks for the question.
3. Draw neat labelled diagrams WHEREVER necessary.
4. Assume suitable data, if necessary.

Q. 1 Define Language and explain types of languages in Formal Language Theory with examples. Explain Directed Graph and Tree with suitable diagrams. (10)

OR

Q. 1 Explain the concepts of Alphabet, String and Language with examples. Draw a tree for derivation of string 'abba'. (10)

Q. 2 Design DFA for strings containing at least two 0's and at most one 1's over {0,1}. Explain with a diagram. (10)

OR

Q. 2 Design finite automata for following Regular Expression (10)
i) ab((a*b)*+a(ab)*)*
ii) [(a+b)* + (a*b*c*)]+(ab* + abc)

Q. 3 Explain Context-Free Grammar. Derive parse tree for the string 'aab' for grammar: (10)
$S \rightarrow aS \mid b$
Explain ambiguity in CFG with example.

OR

Q. 3 Convert the following Right Linear Grammar to Left Linear Grammar (10)
$S \rightarrow 0A|1B$
$A \rightarrow 0C|1A|0$
$B \rightarrow 1B|1A|1$
$C \rightarrow 0|0A$

Q. 4 Design PDA for accepting the following language L: $\{a^n b^m c^n \mid n \geq 1, m \geq 1\}$. (10)

OR

Q. 4 Explain Context-Free Languages (CFL). Describe how PDA is constructed from a CFG. Give one example for conversion. (10)

Q. 5 Design Turing Machine for string contains $a^n b^n$ for a's and b's. (10)

OR

Q. 5 Design a Turing Machine to perform right shift operation on a binary number. (10)

Q. 6 Evaluate the significance of Cook's Theorem in computational theory. (10)

OR

Q. 6 Explain the difference between deterministic and nondeterministic Turing machines. (10)

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