BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)

B. Tech. Sem - IV Computer Science & Engineering AI & ML : SUMMER : 2025

SUBJECT: THEORY OF COMPUTATION

Day : Friday
Date : 23/05/2025

S-23946-2025

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Assume suitable data **WHEREVER** necessary.
4) Draw neat diagrams **WHEREVER** necessary.

Q.1 Design a DFA – **(10)**

i) $L=\{X\in(a,b)^*:|X|a=odd \;\; and \; |X|b=even\}$

ii) $L=\{X\in(a,b)^*|\text{second symbol of X is 0 and fourth is 1}\}$

OR

Q.1 If language L is accepted by NFA then there exists an equivalent DFA that accepts the same language. Explain with example. **(10)**

Q.2 Construct NFA for following RE **(10)**

a) 01*+1 b) ab*+b c) (a+bb)*aa)*
d) (0(00)*1+01*0)* e) 10+(0+11)0*1 f) ab*aa+bba*ab

OR

Q.2 Find Finite Automata without epsilon transition for given regular expression **(10)**

a) $r=$ 10+(0+11)0*1

b) $r=$ (0+1)*(00+11)(0+1)*

c) $r=$ (ab)*ba*(bb+ab)*

Q.3 What is Ambiguity in grammar show the following grammar is ambiguous or not, justify your answer $S\to S+S|S*S|a|b|c$. **(10)**

OR

Q.3 Convert the following grammar into Greibach Normal Form (GNF). **(10)**

$S\to AB$

$A\to BSB|BB|b$

$B\to aAb|a$

Q.4 Design a PDA to accept each of the following languages by final state. **(10)**

a) $\{0^n1^n|n>=1\}$

b) The set of all strings of 0's and 1's with an equal number of 0's and 1's.

OR

Q.4 Demonstrate the languages defined by PDA's are exactly the Context-free languages. **(10)**

Q.5 Explain a Turing Machine with two way infinite tape and write a relation with one way infinite tape. **(10)**

OR

Q.5 Design a Turing machine that accepts $L-\{a^nb^n|n\ge1\}$. **(10)**

Q.6 Show that the following functions are recursive **(10)**

a) n+m

b) nm .

OR

Q.6 Prove the following **(10)**

a) The complement of a recursive language is recursive

b) The union of two recursive language is recursive.

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