Duration: 3 Hours   **[Max Marks: 80]**

N.B : (1) **Question No 1 is Compulsory**.
(2) Attempt any **three** questions out of the remaining **five**.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1			[20]
	a	Explain the ways of acceptance by a PDA.	[05]
	b	Discuss difference in transition function of PDA, TM and FA	[05]
	c	Design DFA that accepts Strings that contain "ba" or "ab" as suffix over $\sum=\{a,b\}$.	[05]
	d	Construct CFG to generate the language $L = \{a^i b^j c^k \mid k=i+j, i, j >=1 \}$	[05]

2	a	Represent RE epsilon for L = {w : w has prefix bab and suffix abb and w is a string over {a,b}. Design NFA with epsilon moves for accepting L. Convert it to minimized DFA.	[10]
	b	Explain Pumping Lemma for regular languages. Prove that given language is not a regular language. $L=\{ a^n b^{n+1} \mid n>=1\}$	[10]

3	a	The grammar G is $S \rightarrow aB \mid bA$, $A \rightarrow a\mid aS \mid bAA$, $B \rightarrow b \mid bS \mid aBB$ Derive using Left Most Derivation(LMD) and Rightmost Derivation (RMD) for the following string "aaabbb". Draw Parse Tree.	[10]
	b	Give formal definition of Push Down Automata. Design PDA that accepts odd palidromes over {a,b,c}, where c exists only at the center of every string.	[10]

4	a	i) Design DFA that accepts Strings that are multiples of 4 $\sum=\{0,1\}$.	[10]
		ii) Design NFA that accepts strings starting with a and ending with a or starting with b and ending in b.	
	b	Design a Mealy machine to change every occurrence of a with x, b with y and c is kept unchanged. Convert the same to equivalent Moore machine.	[10]

5	a	Consider following CFG. Is it already simplified ? Explain you answer. Convert it to CNF form.	[10]

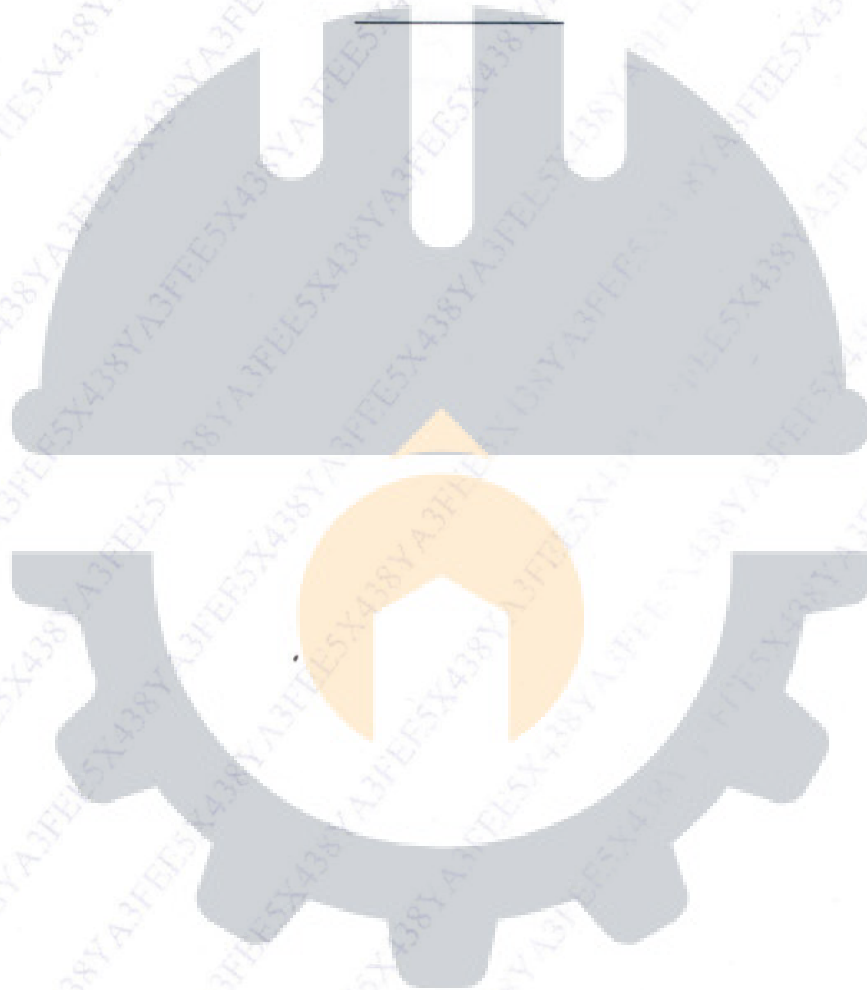$S \rightarrow ASB \mid a \mid bb$
$A \rightarrow aSA \mid a$
$B \rightarrow SbS \mid bb$

	b	Design a TM for converting a input binary number to its one's complement of a binary	[10]

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number.

6   Write Short notes (**Any Four**)   [20]

a   Chomsky Hierarchy

b   Post Correspondence Problem.

c   Arden's Theorem

d   TM-Halting Problem.

e   Variants of Turning Machines