

Time : 3.00 Hrs.

Marks : 80

N.B. : (1) Question No. 1 is compulsory.

(2) Attempt any **three** questions out of the remaining **five** questions.

(3) Assumptions made should be clearly stated.

(4) **Figures** to the **right** indicate **full** marks.

(5) Assume suitable **data** whenever required but **justify** the same.



1. a) Differentiate between NFA and DFA. 5
b) Compare and contrast Moore and Mealy machines. 5
c) Explain variants of Turing Machine. 5
d) Show that the following grammar is ambiguous : 5
$$S \rightarrow aSbS \mid bSaS \mid \epsilon$$
2. a) Convert the following RE into NFA with ϵ -moves and hence obtain the DFA : 10
$$RE = (0 + \epsilon)(10)^*(\epsilon + 1)$$

b) Consider the following grammar $G = \{V, T, P, S\}$, $V = \{S, X\}$, $T = \{a, b\}$ and productions P are : $S \rightarrow aSb \mid aX$
 $X \rightarrow Xa \mid Sa \mid a$
Convert the grammar in Greibach Normal Form. 10
3. a) Construct PDA accepting the language $L = \{a^{2n}b^n \mid n \geq 0\}$. 10
b) Construct TM to check well formedness of parenthesis. 10
4. a) Design Mealy machine to recognize $r = (0 + 1)^*(00 + 11)$ and then convert it to Moore machine. 10
b) Consider the following grammar :
$$S \rightarrow iCtS \mid iCtSeS \mid a$$

$$C \rightarrow b$$

For the string "ibtaeibta", find the following :
i) Left most derivation ,
ii) Right most derivation ,
iii) Parse tree ,
iv) Check if the above grammar is ambiguous or not. 10
5. a) Design a Turing machine that computes a function $f(m,n) = m + n$, the addition of two integers. 10
b) Give the formal definition of pumping lemma for regular language and then prove that the following language is not regular : 10
$$L = \{0^m 1^{m+1} \mid m > 0\}$$
6. Write short note on following (Any two) : 20
a) Chomsky Hierarchy.
b) Decision properties of regular languages.
c) Rice's theorem.
d) Definition and working of PDA.