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 grammer is ambiguous :
S --> aSbS | bSaS | ε . 5

2. a) Convert the following RE into NFA with ϵ- moves and hence obtain the DFA :
RE = (0 + ϵ) (1 0)*(ϵ + 1) . 10
b) Consider the following grammer G = { V , T , P , S) , V = { S , X } , T = { a , b } and productions P are : S --> aSb | aX
X --> Xa | Sa | a .
Convert the grammer in Greibach Normal Form. 10

3. a) Construct PDA accepting the language L = { $a^{2n}b^n$ | n >= 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 grammer :
S --> i C t S | i C t S e S | a
C --> b .
For the string " ibtaeibta" , find the following :
i) Left most derivation ,
ii) Right most derivation ,
iii) Parse tree ,
iv) Check if the above grammer 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 :
L = { 0^m1^{m+1} | m > 0 } . 10

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.