Q.P. Code: 25530

Duration: 3 hours **Total marks: 80**

Note (1) Question No. 1 is compulsory

(2) Attempt any three questions from remaining questions

(3) Draw suitable diagrams wherever necessary

(4) Assume suitable data, if necessary

Q 1. (a) Construct a DFA that accepts all the strings on {0, 1} except those containing the substring 010. **(05)**

(b) Find the CFG for the regular expression (11)*(010+01)*. **(05)**

(c) Write short note on Chomsky Hierarchy. **(05)**

(d) Give formal definition on NFA with epsilon. **(05)**

Q 2. (a) Write NFA for accepting regular Expression (b+ab)*(ba*+b). **(10)**

(b) Design a Moore and Mealy machine for a binary input sequence such that if it has a substring 010 the machine outputs A if input has substring 101 it outputs B otherwise it outputs C. **(10)**

Q 3 (a) Use pumping lemma to show that the set of palindromes is not a regular Language. (palindrome is a string that equals its own reverse, such as 0110). **(10)**

(b) Minimize the following DFA where q_0 is a start state and q_1, q_2 and q_4 are final states. **(10)**

∂	0	1
q_0	q_3	q_1
q_1	q_2	q_5
q_2	q_2	q_5
q_3	q_0	q_4
q_4	q_2	q_5
q_5	q_5	q_5

Q 4 (a) Explain rules for simplification of CFG. **(10)**

(b) Convert given CFG to CNF **(10)**

$S \rightarrow ASB \mid \varepsilon$

$B \rightarrow SbS \mid A \mid bb$

$A \rightarrow aAS \mid a$

Q 5 (a) Design a PDA to accept the language $\{L = a^m b^m c^n \mid m, n>=1\}$ **(10)**

(b) Construct TM for checking well formness of the parenthesis. **(10)**

Q 6 Write short notes on (Any two) **(20)**

(a) Pumping Lemma for Regular Languages

(b) Universal Turing Machine.

(c) Unsolvable Problems
