S.E. (IT) (Sem-IV) (CBS) Date - 17/12/19

Paper / Subject Code: 41005 / Automata Theory

(3 Hours) **Marks:80**

Note: Question **No. 1** is **Compulsory**
Attempt **any three** out of the remaining **five** questions
Assumptions made should be clearly stated

Q.1 Attempt any four sub-questions.

a) Construct the Finite Automata for binary umber divisible by 2 **(05)**

b) Design FA for decimal number divisible by 5 **(05)**

c) Give formal definition of Turing Machine **(05)**

d) State and explain closure properties of regular languages **(05)**

e) Construct DFA accepting all the strings corresponding to the Regular expression
1* 0 1 (0 + 11) * **(05)**

Q2. a) Construct the following grammar to CNF **(10)**

S→ Ba / aB
A→bAA / aS / a
B→aBB / bS / b

b) Design Moore machine for binary adder. **(10)**

Q3.a) Design a DFA corresponding to the regular expression (a+b)* aba (a+b)* **(10)**

b) Define CFG, obtain CGF for the following grammar **(10)**
(110+11)* (10)*

Q4.a) Design a PDA for CFL that checks the well formedness of parenthesis i.e. the language L of all balanced string of two types of parenthesis "( )" and "[ ]".Trace the sequence of moves made corresponding to input string [( ) (( ))]. **(10)**

b) Construct a TM for 2's complement of a binary number. Simulate it for 1 0 1 0 **(10)**

Q5. a) Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 001222. **(10)**

G: S → 0S | 1A | 2B | ε
A → 1A | 2B | ε
B → 2B | ε

b) Consider the CFG S→aSb | bSa | SS | ε , consider the string ***babbabaaaababb*** .prove that given grammar is ambiguous by generating more than one parse tree for a given string **(10)**

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Q6. Write short notes on (20)

a) Applications of Automata Theory
b) Chomsky Hierarchy
c) Power and limitations of PDA
d) Halting Problem.
