TE Sem V (CMPN) R-19 C-Scheme Winter 2025

[80 marks]

(3 hours)

NOTE:

1. **Question No 1 is compulsory**
2. **Attempt any three questions from remaining.**
3. **Assume suitable data if necessary and state the same.**

20

Q1 **Solve all questions below.**

a) Differentiate between NFA and PDA

b) Design a DFA for accepting all strings over {0,1} divisible by 4.

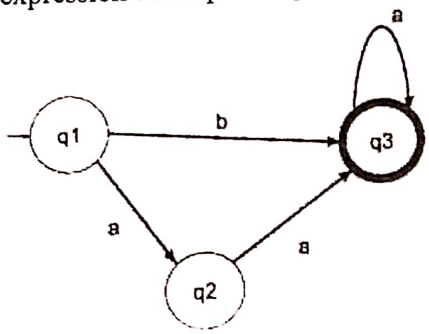
c) Design a Mealy machine to replace each occurrence of sub-string '011' by '010', where $\sum = \{0, 1\}$.

d) Explain Chomsky hierarchy

Q2

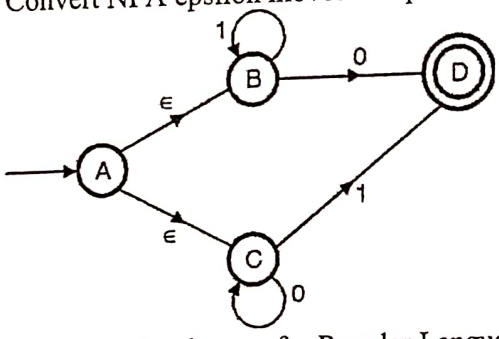
a) Find the grammar in Chomsky Normal form equivalent to grammar having P: S → aAD, A → aB | bAB, B → b, D → d. 10

b) Write down Arden's Theorem. Using Arden's theorem, construct a regular expression corresponding to the state diagram shown below. 10



Q3

a) Convert NFA epsilon moves to equivalent Minimized DFA. 10



b) State Pumping lemma for Regular Languages. Let L = {w.w^K: w^K is reversal of w, w ϵ {0,1}* }; Show that L is not regular. 10

Q4

a) Explain the types of Turing machines in detail. 10

b) Let G be the grammar S →aB | bA, A →a | aS | bAA, B → b |bS | aBB. For the string aaabbabbba. Find Leftmost, Rightmost derivation and Parse tree? 10

Q5

a)	Construct a PDA equivalent to following CFG P: S→0BB, B→0S | 1S | 0. Test if 010000 is in the languages.	10
b)	Design a Turning machine to find 2's complement of a binary number. Show simulation of device on input '1010100'.	10

Q6 Write note on (Any 04)

a)	Post Correspondence Problem	05
b)	Halting Problem.	05
c)	Acceptance by PDA	05
d)	Applications of regular expression and finite automata	05
e)	Universal Turing Machine	05
f)	Closure properties of Regular Languages.	05

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