Total No. of Pages  2
V-SEMESTER
END TERM EXAMINATION

Roll No............
B.Tech.(CO+EL)
Nov/Dec– 2024

## CO-303  THEORY OF COMPUTATION

Time: 3:00 Hours                                                    .Max. Marks: 50

Note: Attempt **any five** questions. Assume suitable missing data, if any

**Q.No. 1**

A. Design a Finite automata (FA) which can check that the decimal of given binary string is divisible by 5 and also write a regular expression for the language $L=\{0^n 1^m \mid (n+m \text{ is even})\}$.

[5] CO1 BTL-3

B. Prove that if L is a context free language (CFL) and F is regular language then L-F is a context free language.    [5] CO4 BTL-6
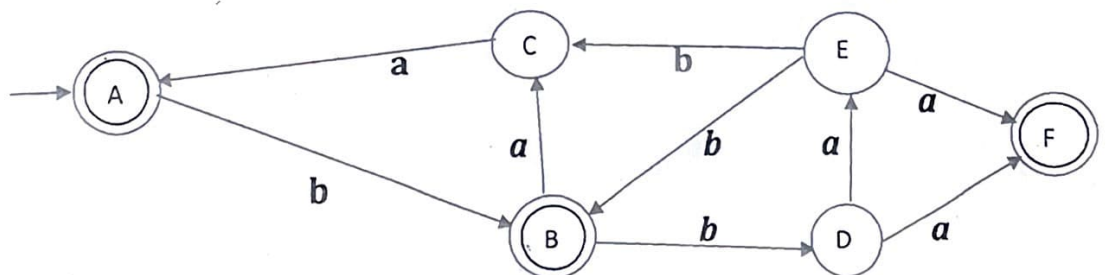
**Q.No. 2**

A. Consider following mealy machine, construct a Moore machine equivalent to this mealy machine                    [5] CO3 BTL-3
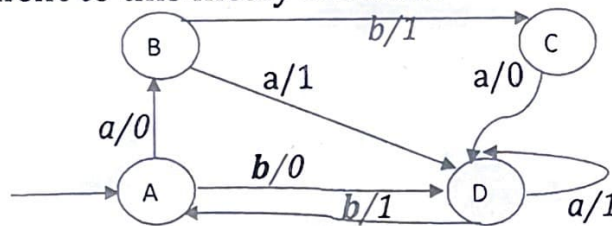


B. Discuss Myhill-Nerode Theorem with example and construct DFA for regular expression$(0 + 1)^*(110 + 01)$.   [5] CO1 BTL-2,3

**Q.No. 3**

A. Explain Arden's theorem and find a regular expression (RE) corresponding to the following FA using Arden's theorem.

[5] CO2 BTL-4

B. How CNF is different from GNF?                                    [5] CO2 BTL-2
   i.   Convert the following grammar to CNF
        $S \to SS$ , $S \to (S)$ , $S \to \epsilon$
   ii.  Convert following CFG to GNF
        $S \to AB$,     $A \to bA \mid a$     $B \to aB \mid \epsilon$

**Q.No. 4**
   A. Construct a Mealy machine which reads the input string from $(0+1)^*$ and produces residue mod-4 for each binary string treated as binary integer.                [5] CO3 BTL-3

   B. What is chomsky's classification for the grammar? Design a Context Free Grammar (CFG) for the language $L = \{ 0^i 1^j 2^k \mid$                [5] CO2 BTL-2,3
      $k \leq i$ or $k \leq j\}$.

**Q.No. 5**
   A. Illustrate pumping lemma for context free language (CFL) and Decide whether the language $L = \{ a^n b^{2n} a^n \mid n \geq 0\}$ is context free.                [5] CO3 BTL-3,6

   B. Design a Push down automata (PDA) for the accepting language $L = \{ 0^n 1^{2n+1}$ for $n \geq 0\}$                [5] CO4 BTL-5

**Q.No. 6**
   A. Design a Turing Machine(TM) to recognize the language $L = \{a^n$                [5] CO5 BTL-5
      $b^n c^n \mid n \geq 1\}$.

   B. Explain following with suitable example
      i.   Pumping Lemma for regular languages and Ambiguity in Grammar.                [2.5] CO2 BTL-2
      ii.  Post correspondence Problem(PCP) and Church's thesis                [2.5] CO6 BTL-2