VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA
Odd Mid Semester Examination for Academic Session 2025-26

COURSE NAME: TOC SEMESTER: 5th

BRANCH NAME: CSE/IT

SUBJECT NAME: **Theory of Computation**

FULL MARKS: **30** TIME: **90 Minutes**

Answer **All** Questions.

The figures in the right hand margin indicate Marks. *Symbols carry usual meaning.*

Q1. Answer all Questions. **[2 × 3]**

a) Construct a DFA for L= {the set of all string where the number of 'a' and number of 'b' in all string is even over ∑={a,b} - CO1

b) Write the regular expression that represent the language of all strings over ∑={0,1}which end with either 0 or 11. - CO2

c) Construct the grammar to derive the language L = $wcw^R | w \in \{a,b\}^*$ and w^R is the reverse of the string w. - CO3

Q2. **[8]**

(a) Construct a DFA that stats with '01' over ∑= {0,1}. - CO1 [3]

(b) Design an NFA with no more than 5 states for the set $\{abab^n | n>0\} \cup \{aba^n | n\geq 0\}$ [3]

(c) NFA is more powerful than DFA. State true or false. Justify your answer. [2]

OR

(a) Construct a DFA that ends with '01' over ∑= {0,1}. - CO1 [3]

(b) Design an NFA that accept 101 as sub-string. [3]

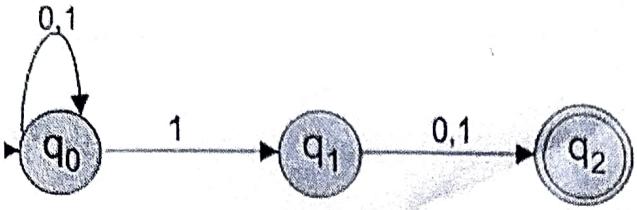
(c) Using pumping lemma for Regular language prove that $\{a^n b^n | n\geq 1\}$ is not a regular language. [2]

Q3. **[8]**

(a) Construct a minimum state automaton equivalent to given automaton whose transition table is given below - CO2 [3]

→q_0	q_1	q_3
q_1	q_2	q_4
q_2	q_1	q_4
q_3	q_2	q_4
*q_4	q_4	q_4

(b) Convert following NFA to DFA. [3]

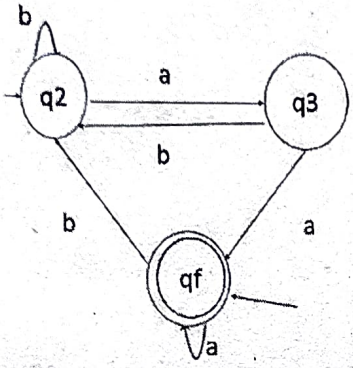


(c) Construct a Moore machine to find the remainder on division by 3. [2]

OR

(a) Construct a Mealy machine remembers past inputs. - CO2 [3]

(b) Find the regular expression for the given automaton [3]



(c) G={{S},{a,b},{S→b|Sa|aS|SS},S}Prove that it is ambiguous. [2]

Q4. **[8]**

(a) Convert the following grammar to GNF. - CO3 [3]

S→XA|BB
B→b|SB
X→b
A → a

(b) Give a deterministic PDA for language L={ $wcw^R|w\epsilon\{a,b\}^*$ and w^R is the reverse of the string w.}. Specify the empty stack acceptance. Write all the possible transition function. [3]

(c) L={$a^ib^jc^k$:0≤ i ≤j ≤k}. show that this language is not CFL. [2]

OR

(a) Convert the following grammar to GNF. - CO3 [3]

S→AB
A→BS|b
B→SB|a

(b) Give a deterministic PDA for language L={$a^ncb^{2n}|n\geq1$} over the ∑={a,b,c}. Specify the acceptance state. Write all the possible transition function. [3]

(c) L={$a^nb^nc^n$: n≥0}. show that this language is not CFL. [2]