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Question Paper Code: U5203

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fifth Semester

Computer Science and Engineering

21UCS503 – THEORY OF COMPUTATION

Common to CSE (AI & ML)

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

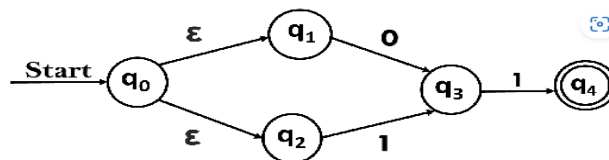
Answer All Questions

PART A - (10 x 2 = 20 Marks)

1. Construct a finite automata for the language $L = \{ 0^n \mid n \bmod 3 = 2, n \geq 0 \}$. CO2 App
2. Obtain a NFA to accept the Language L with input symbol $\{0,1\}$ in which it accepts all string ending with 01. CO2 App
3. Construct regular expression for the language with an input symbol $\Sigma = \{a,b\}$. where all the strings begins and ends with 'a'. CO2 App
4. Convert the following Regular grammar into finite automata
 $S \rightarrow 0A \mid 1A, A \rightarrow 0A \mid 1A \mid +B \mid -B, B \rightarrow 0B \mid 1B \mid 0 \mid 1$ CO2 Ap
5. Find the language $L(G)$ of the grammar
 $S \rightarrow aSb \mid aAb, A \rightarrow bAa \mid ba$. CO2 App
6. Simplify the following CFG by removing unit Production.
 $S \rightarrow A \mid 1, A \rightarrow 01 \mid 10$ CO2 App
7. Difference Between Finite Automata and PDA. CO1 U
8. List out the closure properties of CFL. CO1 U
9. Differentiate Recursive and Recursively Enumerable Language. CO1 U
10. List out different techniques for Turing Machine Construction. CO1 U

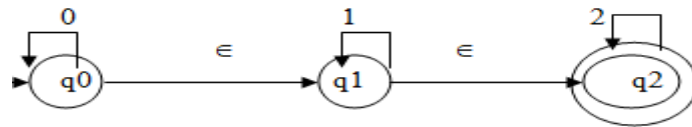
PART – B (5 x 16 = 80 Marks)

11. (a) Consider the following ϵ -NFA. Find its equivalent DFA. CO2 App (16)

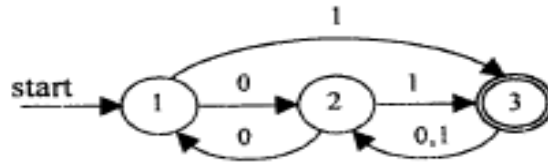


Or

- (b) Remove the epsilon and convert the following automata into DFA CO2 App (16)

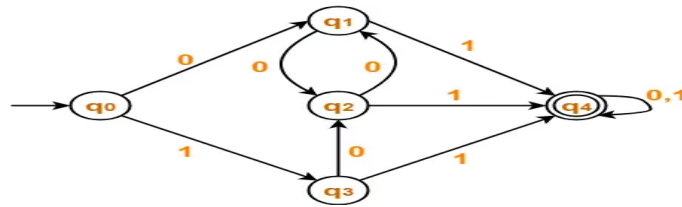


12. (a) Find the regular expression for the following deterministic finite automata using Rij Method CO2 App (16)



Or

- (b) Illustrate Table filling Method to Minimize the following DFA CO2 App (16)



13. (a) Simplify the following grammar and find its equivalent in CNF.
 $S \rightarrow bA \mid aB$,
 $A \rightarrow bAA \mid aS \mid a$,
 $B \rightarrow aBB \mid bS \mid b$ CO2 App (16)

Or

- (b) Convert the following CFG to Greibach Normal Form
 $S \rightarrow CA \mid BB$
 $B \rightarrow b \mid SB$
 $C \rightarrow b$
 $A \rightarrow a$ CO2 App (16)

14. (a) Convert the PDA $M = (\{q_0, q_1\}, \{0, 1\}, \{X, Z_0\}, \delta, q_0, Z_0, \Phi)$ into Grammar. Where δ is defined as
 a. $\delta(q_0, 0, Z_0) = (q_1, XZ_0)$
 b. $\delta(q_0, 0, X) = (q_1, XX)$
 c. $\delta(q_0, 1, X) = (q_1, \epsilon)$
 d. $\delta(q_1, 1, X) = (q_1, \epsilon)$
 e. $\delta(q_1, \epsilon, X) = (q_1, \epsilon)$
 f. $\delta(q_1, \epsilon, Z_0) = (q_1, \epsilon)$ CO2 App (16)

Or

- (b) (i) Construct PDA for the Language $L = \{0^m 1^m \mid m \geq 1\}$ (10) CO2 App (16)
(ii) Convert the following CFG to Push Down Automata. (6)

$S \rightarrow aDB$

$A \rightarrow aD$

$B \rightarrow b$

$D \rightarrow a$

$C \rightarrow a$

15. (a) Construct Turing Machine for the Language $L = \{a^n b^n\}$ where $n \geq 1$. CO2 App (16)
Or
(b) Compute Turing Machine for the function $f(x) = x + 3$. CO2 App (16)

