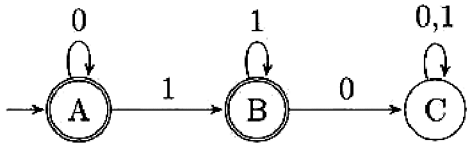

(b) Construct the DFA for the following over the alphabet {0, 1} that accept the language $L = \left\{(01)^i 1^{2j} \mid i > 1,\ j >= 1\right\}$. **7.5**

Section C

5. (a) Construct the Grammar for the following Languages :

(i) $L = \left\{a^m b^n \mid m < n \text{ and } m, n >= 1\right\}$

(ii) $L = \left\{w \in \{a, b\}^* \text{ the number of } a\text{'s in } w \text{ is divisible by } 3\right\}$. **7.5**

(b) Construct a PDA that accepts the language $\left\{a^i b^j c^k \mid i,\ j,\ k > 0,\ i + k = j\right\}$. **7.5**

6. (a) Construct the Grammar for the following Languages :

(i) $L_1 = \left\{a^n b^m a^m a^n \mid n,\ m > 0\right\}$

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Sep-21-00072

B. Tech. EXAMINATION, 2021

Semester IV (CBCS)

THEORY OF COMPUTATION

CS-404

Time : 2 Hours *Maximum Marks : 60*

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. **9** is compulsory.

Section A

1. (a) Construct DFA for the following languages over the alphabet (0, 1) :

(i) L_1 = {w | w contains even number of 0's and even number of 1's}

(ii) $L_2 = \{w \mid w$ contains even number of 1's divisible by 3 and at least two 0's$\}$. **7.5**

(b) Write statement for Pumping Lemma for Regular Expressions. Also prove that the language $L = \{a^n b^n \mid n > 0\}$ is not regular. **7.5**

2. (a) Construct an NFA for the language generated by regular expression $(ab + ba)^* abb$ and convert it into equivalent DFA. **7.5**

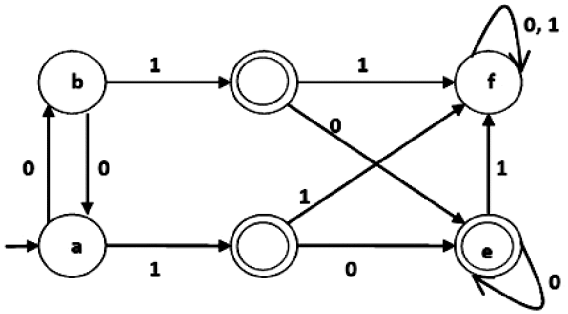
(b) Convert the following mealy machine to Moore machine :

Present State	Next State a		Next State b	
	State	O/P	State	O/P
q_1	q_1	1	q_2	0
q_2	q_4	1	q_4	1
q_3	q_2	1	q_3	1
q_4	q_3	0	q_1	1

7.5

Section B

3. (a) Minimize the following DFA using equivalence theorem and Myhill Nerode Theorem : **7.5**



(b) What do you understand by Regular Expressions ? Write regular expressions for the following languages over (a, b) :

(i) Language containing all strings of even number of a's.

(ii) Language containing all strings which have at least two a's. **7.5**

4. (a) Prove R = QP*, where R, Q and R are regular expressions and P does not contain ε. Find the regular expression for the Finite Automaton given ahead : **7.5**

(ii) What are the problems with left factored grammar and how to remove it ? **2**

(iii) Explain Church's Thesis. **2**

(iv) What is GNF and its uses ? **1**

(v) Explain the applications of Moore and Mealy Machine. **2**

(vi) What do you mean by Universal Turing Machine ? **2**

(vii) Explain right most derivation of a grammar. **2**

(viii) Explain Chomsky Hierarchy of Grammars with accepting models. **2**

(ii) $L_2 = \{w \mid w \in (a+b)^*$ and w contains equal number of a's and b's$\}$. **7.5**

(b) Construct a PDA that accepts the language $\{a^i b^j \mid 2i \neq 3j\}$. **7.5**

Section D

7. Design a Turing machine that can compute proper subtraction, i.e. m-n, where m and n are positive integers and $m > n$ and if $m <= n$ then the result will be 0. **15**

8. (a) Construct a Turing Machine for :

$$L = \{a^n b^n c^n \mid n > 0\}. \quad \textbf{7.5}$$

(b) What do you understand by an ambiguous grammar ? Find whether the following grammar is ambiguous or not :

S – > a | abSb | aAb

A – > bS | aAAb. **7.5**

(Compulsory Question)

9. Answer the following questions briefly :

(i) Compare NDFA and DFA with respect to complexity and accepting power. **2**