MIT ACADEMY OF ENGINEERING

COURSE CODE: CS342T/CS303T **01 AUGUST 2023**

TY BTECH SEMESTER - V REMEDIAL TERM 2022 - 2023

EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

REMEDIAL EXAMINATION

THEORY OF COMPUTATION

TIME : 3 Hrs **MAX MARKS : 100**

TOTAL NO OF QUESTIONS: 5 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a) Solve any two of the following. **[10] CO1 L1**

i) Draw DFA over alphabet {0,1} where the number is divisible by 5

ii) Ending with aba

i) Starting and ending with different alphabet.

b) Convert the follwing NFA to DFA. **[10] CO2 L3**

State	0	1
–>p	{p,q}	{p}
q	{r}	{r}
r	{s}	Φ
S*	{s}	{s}

2 a) Identify the language of the following Regular expressions. **[10] CO1 L2**

i) (a+b)*aab(a+b)*

ii) a(a+b)*a

iii)$(a+b)^3$

iv)b*ab*ab*

v)ab(a+b)*

b) Convert the Regular expression to DFA **[10] CO3 L3**

a(a+b)*b

3 a) The following are the state diagrams of two DFAs, M1 and M2. Answer the following questions about each of these 2 machines. **[10] CO1 L2**

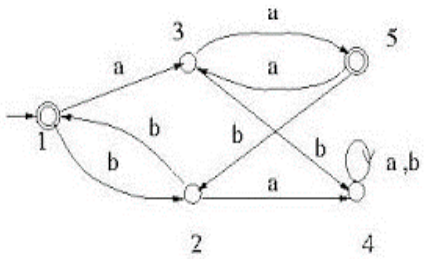
a. What is the start state?

b. What is the set of accept states?

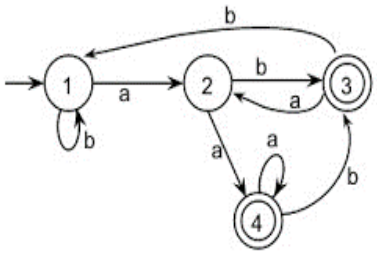
c. What sequence of states does the machine go through on input aabb?

d. Does the machine accept the string aabb?

e. Does the machine accept the string ε?□



M1



M2

b) Convert the following CFG to CNF. **[10] CO3 L3**

S → ASB

A → aAS|a|ε

B → SbS|A|bb

4 a) Design Pushdown Automata for the language **[8] CO2 L3**

L={a^2n b^n | n>=1}

b) Convert the CFG to Pushdown Atomata. **[8] CO3 L3**
S->aA|bBB|a
A->aBB|bA|b

c) Explain any two applications of regular expression. **[4] CO1 L2**

5 a) Solve any one of the following **[10] CO2 L3**

i) Design turing Machine for 2's complement of a binary Number.

ii) Design turing Machine for L={a^n b^n c^n| n>=1}

b) Explain any two of the following. **[10] CO5 L2**

i) Turing decidable Langage

ii)Prove that A_{DFA} is decidable.

iii)Difference between NP complete and NP Hard.

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS342T **15 DECEMBER 2023**

TY BTECH SEMESTER-V 2023 REGULAR 2023-2024 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

END SEMESTER EXAMINATION

THEORY OF COMPUTATION

TIME : 2 HRS **MAX MARKS :50**

TOTAL NO OF QUESTIONS: 3 **TOTAL NO OF PRINTED PAGES:02**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Convert the follwing grammer into equilant GNF S->0AS, S->a, A-.SbA/SS/ba *Evaluation scheme: Correct GNF conversion 5 M*	**[5]**	**CO3**	**L3**
	b)	Construct a PDA equivalent to the following grammer S->aAA, A-.aS/bS/a *Evaluation scheme: Correct PDA conversion 5 M*	**[5]**	**CO3**	**L3**
	c)	Convert given PDA to euivalent simplified CFG M= ({q0,q1}, {0,1},{Z0,X}, ɗ, q0,Z0,F) ɗ (q0,1,z0) ={(q0,xz0)}, ɗ (q0,1,x) ={(q0,xx)}, ɗ (q1,1,x) ={(q1,ε)}, ɗ (q0,0,x) ={(q1,x)}, ɗ (q1,0,z0) ={(q0,z0)}, ɗ (q0,ε,zo) ={(q0,ε)}, *Evaluation scheme: conversion to CFG 5M, simplification of CFG 4M, identification of language 1M*	**[10]**	**CO4**	**L5**
2	**a)**	An industry need to design a machine which will shift the input string, right by 1 place over {0,1}, write a transition state table for the same.	**[4]**	**CO4**	**L4**

	b)	Design a minimum possible automata machine that replaces every occurrence of "abb" by "baa". Draw Sate transition diagram. *Evaluation scheme: Correct transition diagram with correct annotaion 6M*	**[6]**	**CO4**	**L4**
	c)	Design a minimum possible automata machine for f(x,y) which evaulates the multiplication of two numbers ie. For numbers x and y , f(x,y)=x*y Draw Sate transition diagram. *Evaluation scheme: Correct transition diagram with correct annotaion 6M*	**[10]**	**CO4**	**L4**
3	**a)**	Proove that every context free language is decidable.	**[5]**	**CO5**	**L1**
	b)	Define P & NP class problems with praper example. *Evalaution scheme : defination 2M, example 3M*	**[5]**	**CO5**	**L2**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS342T **15 JUNE 2023**

TY BTECH SEMESTER - V RE-EXAMINATION BACKLOG 2019 PATTERN 2022-2023 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

RE-EXAMINATION

THEORY OF COMPUTATION

TIME : 3 Hrs **MAX MARKS : 100**

TOTAL NO OF QUESTIONS: **TOTAL NO OF PRINTED PAGES:02**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a)	Design a finite automata E2 to recognize the regular language of all strings that contains the string 001 as substring. *(Correct diagram 5 M and correct Transition table 5 M)*	**[10]**	**CO1 L3**
b)	Design a Nondeterministic Finite automata for A be the language consisting of all strings over {0,1} containing a 1 in the third position from the end. *(Correct diagram 5 M and correct Transition table 5 M)*	**[10]**	**CO1 L3**
2 a)	Convert the NFA designed in Q1 B in to its equivalent DFA. *(Correct diagram 5 M and correct Transition table 5 M)*	**[10]**	**CO3 L3**
b)	Write a languagae for given regular expression. (1) $0*10*$ (2) $\Sigma^*001\Sigma^*$ (3) $1^*(01+)^*$ (4) $(0 \cup \varepsilon)(1 \cup \varepsilon)$ (5) $\emptyset^*$ *(Each correct language 2 M)*	**[10]**	**CO2 L2**
3 a)	Construct a DFA from the regular expression $(a \cup b)^*aba$ and convert the same to NFA. *(DFA 5 M and NFA 5M)*	**[10]**	**CO2 L3**

b) The following are the state diagrams of two DFAs, M1 and M2. Answer the following questions about each of these 2 machines. **[10] CO2 L3**

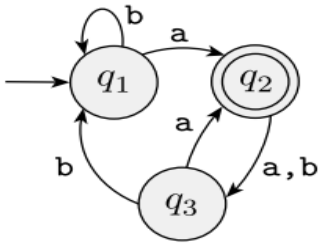
a. What is the start state?

b. What is the set of accept states?

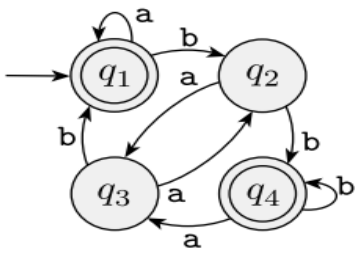
c. What sequence of states does the machine go through on input aabb?

d. Does the machine accept the string aabb?

e. Does the machine accept the string ε?



M_1



M_2

4 a) Let G be the following CFG and convert it to Chomsky normal form by using the conversion procedure. **[10] CO4 L3**

S → ASA | aB

A → B | S

B → b | ε

(remove e rule 3 M, remove unit s rule 3 M, remove unit A, B rule 3 M, final grammer 1 M)

b) Draw State diagram and draw Sate transition table for the PDA M1 that recognizes $\{0^n1^n | n \geq 0\}$ **[10] CO4 L3**

(State transition table 5 M and state transition diagram 5M)

5 a) Design a Turing machine to compute proper subtraction of two unary numbers. The subtraction function is defined as follows. F(m,n)= m-n, if m>n and F(m,n)=0 otherwise. *(State table 5 M, State diagram 5 M)* **[10] CO4 L3**

b) Define P & NP class problems with praper example. *(Evalaution scheme : defination 4M,Explanation example 6M)* **[10] CO5 L2**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS342T/CS303T **20 SEPTEMBER 2023**

TY BTECH SEMESTER-V 2019 REGULAR 2023-2024 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

MID SEMESTER EXAMINATION

THEORY OF COMPUTATION

TIME : 2 HOUR **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 4 **TOTAL NO OF PRINTED PAGES: 2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a) Design the regular expression any two of the following Languages. **[4] CO2 L3**

i) $|W|_a >= 2$ over $\Sigma=\{a,b\}$

ii) Starting and ending with same Symbol over $\Sigma=\{0,1\}$

iii) 27th alphabet from right is a over $\Sigma=\{a,b\}$

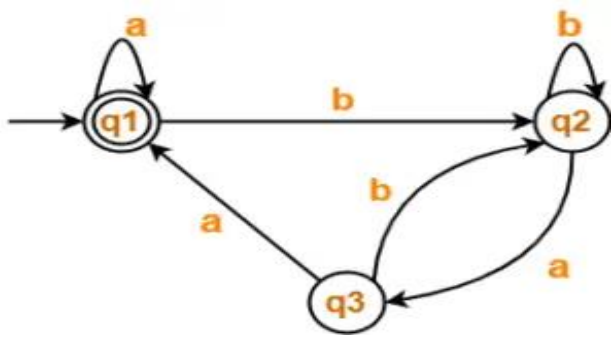
b) Design DFA for the following Language. **[6] CO1 L2**

L={ a^n b^2n | n>=1}

2 a) Convert the following NFA to DFA where q0 is initial state. **[8] CO3 L3**

State	Input	
	a	b
q0	{q0,q1)	{q0}
q1	{q2}	{q2}
q2	{q3}	Φ
q3*	{q3}	{q3}

b) Convert the following DFA to Regular Expression using Arden's Theorum. **[6] CO3 L3**



3 **a)** Design DFA for the Language over Σ={0,1} having 00 as substring but not having 000 as a substring. **[4] CO2 L3**

b) Explain any two applications of Context free Grammar. **[4] CO1 L2**

c) Design DFA for the Language over Σ={0,1} having either even number of 1s or the value is divisible by 4. **[6] CO3 L3**

4 **a)** Design CFG any two of the following Languages. **[6] CO2 L3**

i) Language over alphabet ={a,b} having equal number of a's and b's

ii) L={ $a^i b^j c^k$ | j=i+k }

iii) (0+1)* 1* (1+(01)*)

b) Design Pushdown Automata fo the following Languages **[6] CO2 L3**

L= { $a^{3n} b^{4n}$ | n>=1}

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS342T/CS303T **10 DECEMBER 2022**

TY BTECH SEMESTER - V 2022 - 2023 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

END SEMESTER EXAMINATION

THEORY OF COMPUTATION

TIME : 2 HOURS **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 3 **TOTAL NO OF PRINTED PAGES: 2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 a) Construct A PDA for given grammer containing S->AB, B-> SC, C-> EE, S->AC, A->0, E->1 **[5] CO3 L3**

b) For PDA ({q0,q1}, (0,1), {z0,x}, ɗ, q0,ϕ) obtain CFG accepted by PDA and simplify the CFG. Describe the langauge accepted by it. **[15] CO4 L5**

ɗ (q0,1,z0) ={(q0,xz0)}, ɗ (q0,1,x) ={(q0,xx)},
ɗ (q1,1,x) ={(q1,ε)}, ɗ (q0,0,x) ={(q1,x)},
ɗ (q1,0,z0) ={(q0,z0)}, ɗ (q0,ε,zo) ={(q0,ε)},
Evaluation scheme: conversion to CFG 8M,
simplification of CFG 5M, identification of language 2M

2 a) Design a Turing machine to make a copy of string over {0,1} the input will be B, 1,1,0,0,#, B…. And expected output will be B,1,1,0,0,#,1,1,0,0,B evaluation scheme: correct state transition diagram 5M, **[5] C03 L3**

b)	Design a Turing machine to compute multiplication of two unary numbers. Evaluation scheme: correct state transition diagram 10M	**[10]**	**CO3**	**L3**
c)	An industry requires to design a machine such that it erases all non blank symbols on the tape, where the sequence of non-blank symbols does not contain any blank symbol B in between. Identify the machine is most suitable for this with proper justification (FA, DFA, PDA, NPDA, TM). Draw a state transtion diagram for the same. Evaluation scheme: Identification of machine 1M, justification 1M, STD 3M.	**[5]**	**CO4**	**L5**
3 a)	Prove that whether two DFA recognizes the same language is decidable.	**[5]**	**CO5**	**L2**
b)	Define P & NP class problems with praper example. Evalaution scheme : defination 2M, example 3M	**[5]**	**CO5**	**L2**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T/CS342T/IT301T **30 May 2022**

TY BTECH SEMESTER - V RE-EXAMINATION 2021 - 2022 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

RE-EXAMINATION

THEORY OF COMPUTATION / COMPUTABILITY THEORY

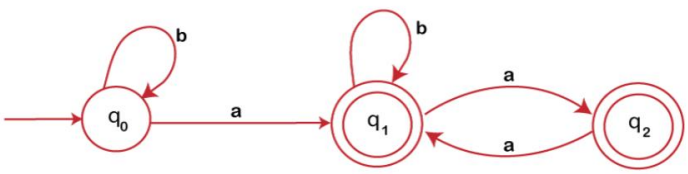
TIME : 3 HOURS **MAX MARKS : 100**

TOTAL NO OF QUESTIONS: 06 **TOTAL NO OF PRINTED PAGES: 02**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Convert the regular expression into DFA. a*(a+b)*aba*	**[8]**	**CO1**	**L3**
	b)	Design Deterministic Finite Automate for the language over alphabet {0,1} which accepts the string that ends with 001 and its value is divisible by 04.	**[8]**	**CO1**	**L3**
	c)	Write the regular expression for any two of the following Languages over the alphabet {a,b}. i) the number of a's divisible by 3. ii) starts with a and ends with b. iii) at least 3 a's.	**[4]**	**CO2**	**L2**
2	**a)**	Convert the Following DFA into regular expression using Arden's Theorum	**[8]**	**CO3**	**L3**



	b)	Design CFG for the following Language. i)0(0+1)*01(0+1)*1 ii)L={a^i b ^j , i<=j<=2i , i>=1}	**[6]**	**CO2**	**L3**

3	**a)**	Construct the NFA to DFA.	**[6]**	**CO3**	**L3**

	0	1
P	{P,Q}	R
Q	R	R
R	S	Q
*S	S	S

	b)	Is the following CFG ambiguous? Explain with the reasoning. S->aAS | a A->SbA | SS | ba	**[4]**	**CO2**	**L3**
	c)	Convert the following Grammer into equivalent CNF. S-> PQP P->0P| ε Q->1Q | ε	**[6]**	**CO2**	**L3**
4	**a)**	Explain any two applications of CFG in detail.	**[4]**	**CO1**	**L2**
	b)	Choose a minimum possible Automata for the following Language. L={a^n b^n c^m d^m | n,m >=1}. Defend the choice of Automata and draw the same.	**[6]**	**CO4**	**L5**
	c)	Construct CFG for the following PDA. ð (q0,1,z0) ={ (q0,xz0)} ∂ (q0,1,x) ={ (q0,xx)} ∂ (q0,0,x) ={ (q1,x)} ∂ (q0,ε,z0) ={ (q0,ε)} ∂ (q1,1, x) ={ (q1,ε)} ∂ (q1,0,z0) ={ (q0,z0)}	**[8]**	**CO3**	**L3**
5	**a)**	Design Turing Machine for reversing a string over alphabet {a,b}.	**[8]**	**CO2**	**L3**
	b)	Design Turing Machine for Multiplication of two unary numbers.	**[10]**	**CO2**	**L3**
	c)	Explain Chomsky Hiararchy.	**[4]**	**CO1**	**L2**
6	**a)**	Prove that E_{DFA} is decidable.	**[5]**	**CO5**	**L2**
	b)	Explain any one of the following in detail. i) NP Complete ii) Halting Problem	**[5]**	**CO5**	**L2**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T **20 SEPTEMBER 2022**

TY BTECH SEMESTER-V 2022-23 2016 BACKLOG EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

MID SEMESTER EXAMINATION

THEORY OF COMPUTATION

TIME : 2 HOURS **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 4 **TOTAL NO OF PRINTED PAGES: 02**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 **a)** Design DFA for the binary numbers which are divisible by 3 and contains substring 101. **[6] CO3 L3**

b) Convert the following NFA to DFA. **[6] CO3 L3**

State	0	1
q0	{qo,q1}	{q0}
q1	{q2}	{q2}
q2	{q3}	Φ
q3*	{q3}	{q3}

2 **a)** What is the Regular Expression for declaring variable name in Javascript. **[2] CO2 L3**

	b)	Explain which language is defined in the given Reguar Expression. i) a(a+b)*a+a ii)Φ*	**[2]**	**CO2**	**L2**
	c)	Design the Regular Expression for the following Languages. i) $\|W\|_a$= 3 mod 3 over alphabet {a,b} ii) 7th Symbol from right is 0 over alphabet {0,1}	**[4]**	**CO2**	**L2**
3	**a)**	Convert the following regular expression to minimized DFA. 01 ((10)* + 111) * 1 RE to ε NFA (2 marks) ε NFA to DFA (6 Marks) DFA minimization (2 Marks)	**[10]**	**CO3**	**L3**
	b)	Design DFA for the language L over alphabet {a}. L= {a^n | n is prime}	**[5]**	**CO1**	**L2**
4	**a)**	Design CFG for the following Languages. i) L = (a^m b^n c^p d^q | m+n=p+q} ii) Equal number of a's and b's over alphabet {a,b}	**[6]**	**CO2**	**L3**
	b)	Explain with reasons whether the following grammar is ambiguous. E -> E+T | T T -> T*F | F F -> (E) | a | b	**[3]**	**CO2**	**L2**
	c)	Convert the following CFG to CNF. S -> AACD A-> aAb | ε C->aC|a D->aDa |bDb| ε	**[6]**	**CO2**	**L3**

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS342 **20 SEPTEMBER 2022**

TY BTECH SEMESTER-V 2022-23 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

MID SEMESTER EXAMINATION

THEORY OF COMPUTATION

TIME : 2 HOURS **MAX MARKS : 50**

TOTAL NO OF QUESTIONS: 4 **TOTAL NO OF PRINTED PAGES: 02**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 **a)** Design DFA for the binary numbers which are divisible by 3 and contains substring 101. **[6] CO3 L3**

b) Convert the following NFA to DFA. **[6] CO3 L3**

State	0	1
q0	{qo,q1}	{q0}
q1	{q2}	{q2}
q2	{q3}	Φ
q3*	{q3}	{q3}

2 **a)** What is the Regular Expression for declaring variable name in Javascript. **[2] CO2 L3**

b) Explain which language is defined in the given Reguar Expression. **[2] CO2 L2**
i) a(a+b)*a+a
ii)Φ*

	c)	Design the Regular Expression for the following Languages. i) $\|W\|_a$= 3 mod 3 over alphabet {a,b} ii) 7th Symbol from right is 0 over alphabet {0,1}	**[4]**	**CO2**	**L2**
3	**a)**	Convert the following regular expression to minimized DFA. 01 ((10)* + 111) * 1 RE to ε NFA (2 marks) ε NFA to DFA (6 Marks) DFA minimization (2 Marks)	**[10]**	**CO3**	**L3**
	b)	Design DFA for the language L over alphabet {a}. L= {a^n | n is prime}	**[5]**	**CO1**	**L2**
4	**a)**	Design CFG for the following Languages. i) L = (a^m b^n c^p d^q | m+n=p+q} ii) Equal number of a's and b's over alphabet {a,b}	**[6]**	**CO2**	**L3**
	b)	Explain with reasons whether the following grammar is ambiguous. E -> E+T | T T -> T*F | F F -> (E) | a | b	**[3]**	**CO2**	**L2**
	c)	Convert the following CFG to CNF. S -> AACD A-> aAb | ε C->aC|a D->aDa |bDb| ε	**[6]**	**CO2**	**L3**

Seat No:

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T **07 DECEMBER 2019**

TY BTECH SEMESTER - V 2019 - 2020 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

END SEMESTER EXAMINATION

THEORY OF COMPUTATION

TIME : 3 HOURS **MAX MARKS : 100 MARKS**

TOTAL NO OF QUESTIONS: 07 **TOTAL NO OF PRINTED PAGES:02**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1 **a)** Write Regular expression for javascript form validation of i) Email id ii) Contact number **[4]** **CO3** **L3**

b) Design the following NFA into DFA. **[6]** **CO3** **L3**

State	0	1
->A	{B,D}	{ }
B	{C,E}	{ }
C*	{E}	{C}
D	{ }	{A}
E	{C,D}	{ }

2 **a)** Describe the language accepted by following Regular Expression. **[4]** **CO3** **L3**

i) $a + a\,(a+b)^{*}\,a$

ii) $(a+b)^{3}(a+b)^{*}$

b) Design Moore machine to output the modulo divide by 3. Convert the Moore machine to mealy machine. **[6]** **CO2** **L3**

3	**b)**	Convert the following Grammer into CNF. S->AACD A->aAb | ε C->aC | a D->aDa | bDb | ε	**[6]**	**CO3**	**L3**
	c)	Design CFG for i)matching parantheses ∑ ={ (,) } ii)L={$a^i b^j c^k$|j=i+k}	**[6]**	**CO3**	**L3**
4	**a)**	Design Push Down Automata for language L L={$a^i b^j c^k$|j=i or j=k where i,j,k>=1}	**[8]**	**CO3**	**L3**
	b)	Identify & Design Automata to accept the language L={$a^i b^j c^k$|i=j=k and i,j,k >=1}	**[8]**	**CO4**	**L5**
5	**a)**	Design Turing machine to check whether the string over a,b is palindrome.	**[8]**	**CO3**	**L3**
	b)	Design Turing machine that replaces every occurance of abb by baa over alphabet {a,b}	**[10]**	**CO3**	**L3**
6	**a)**	Design the PDA for accepting language L L={$a^i b^j$|j=i where i,j>=1} Convert the PDA into CFG.	**[12]**	**CO3**	**L3**
	b)	Convert the CFG into PDA. S->S+S|S*S|4|2	**[6]**	**CO3**	**L3**
7	**a)**	Explain Decidability.	**[4]**	**CO5**	**L2**
	b)	Proove that E_{DFA} is Decidable Language.	**[6]**	**CO5**	**L3**
	c)	Explain NP Complete & NP Hard Problems.	**[6]**	**CO5**	**L2**

Seat No:

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T **3 OCTOBER 2019**

TY BTECH SEMESTER - V 2019 - 2020 EXAMINATION

DEPARTMENT OF COMPUTER ENGINEERING

IN SEMESTER EXAMINATION

THEORY OF COMPUTATION

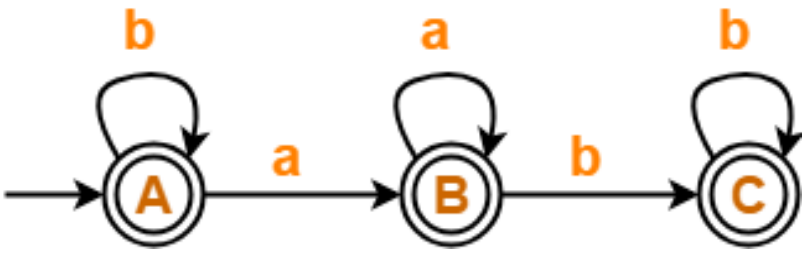
TIME : 2 HOURS **MAX MARKS : 50 MARKS**

TOTAL NO OF QUESTIONS: 3 **TOTAL NO OF PRINTED PAGES: 2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Design Deterministic Finite Automata which accepts all the strings over = {a,b} and containg the strings of form $a^{2n}b^{n}$	**[4]**	**CO1**	**L4**
	b)	Show that the following grammar is ambigious grammar : S → 0S1S | 1S0S | 0 | 1	**[4]**	**CO3**	**L2**
	c)	Design contest free grammar for the following: i) ((ab + ba)* a a b*)* ii) $a^{2n}b^{2n}$ where n > 0	**[4]**	**CO2**	**L2**
2	**a)**	Convert the following DFA to Regular Expression using Arden's Theorem	**[6]**	**CO3**	**L3**



b) Identify the type of the machine (Melay or Moore) represented by the following table and convert it into its other type **[6] CO2 L3**

input → / state ↓	a		b	
	state	output	state	output
→ q_0	q_0	0	q_2	1
q_1	q_2	1	q_3	1
q_2	q_2	1	q1	1
q_3	q_1	0	q_2	0

c) Design Finite Automata which accepts all the strings over ∑ = {a,b} and containing at least 3 a's and at most 3 b's **[6] CO3 L3**

3 **a)** Convert the following regular expression into minimized DFA : b* + b*ab* **[10] CO2 L3**

b) Convert the following grammar into Greibach Normal Form **[10] CO3 L3**

S → ABA

A → aA | bA | ε

B → aab

[2]

Seat No:

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T **15 JANUARY 2019**

TY BTECH SEMESTER - V 2018 - 2019 RE - EXAMINATION

CYCLE - 2

DEPARTMENT OF COMPUTER ENGINEERING

END COURSE RE - EXAMINATION

THEORY OF COMPUTATION

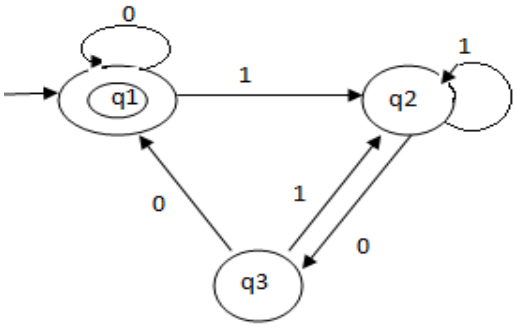
TIME : 3 HOURS **MAX MARKS : 100 MARKS**

TOTAL NO OF QUESTIONS: 8 **TOTAL NO OF PRINTED PAGES: 2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Explain closure properties of Finite Autmata.	**[4]**	**CO1**	**L1**
	b)	Design the mealy machine for printing modulo 3 of binary number. Convert the mealy Machine to Moore equivalent.	**[6]**	**CO2**	**L2**
2	**a)**	Design the Regular Expression for i)4th Symbol from left end is b for ∑= {a,b} ii)Starts and Ends with Different Symbol ∑= {a,b}	**[4]**	**CO3**	**L3**
	b)	Convert the following DFA into Regular Expression	**[6]**	**CO2**	**L2**



3	**a)**	Explain applications of regular expression.	**[4]**	**CO1**	**L1**
	c)	Design DFA which accepts all strings having even no of 0s and 1s. ∑= {0,1}	**[6]**	**CO3**	**L3**

4	**a)**	Select an Automata for the machine which accepts the Language L. Where $L=\{a^n b^n c^n \mid n>=1\}$. Justify the choice of Automata. Design the Automata for the language.	**[10]**	**CO4**	**L4**
	b)	Design CFG for the language $L=\{a^m b^n c^p d^q \mid m=n \ \& \ p=q\}$ where m,n,p,q >=1	**[6]**	**CO3**	**L3**
5	**a)**	Convert the following CFG into CNF. S->PQP P->0P | ϵ Q-> 1Q | ϵ	**[6]**	**C02**	**L2**
	b)	Design Push Down Automata for the Language $L=\{a^i b^j c^k \mid i+j=k, i,j,k>=0\}$	**[8]**	**CO3**	**L3**
6	**a)**	Convert the following CFG into GNF. E->E+T | T T->T*F| F F->(E) |a	**[8]**	**CO2**	**L3**
	b)	Check whether following CFG is Ambiguous. S->aS | ϵ S->aSbS	**[4]**	**CO3**	**L3**
7	**a)**	Design Push Down Automata for palindrome over alphabet {a,b}	**[8]**	**CO3**	**L3**
	b)	Design a Turing Machine which calculate addition of two unary numbers.	**[6]**	**CO3**	**L3**
8	**a)**	Design a Turing Machine that reverse a string over alphabet ∑= {a,b}	**[8]**	**CO3**	**L3**
	b)	Convert the following CFG into PDA. S-> 0A1 A->0A1 | B B->1B | 1	**[6]**	**CO2**	**L2**

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MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T **27 DECEMBER 2018**

TY BTECH SEMESTER - V 2018 - 2019 EXAMINATION

CYCLE - 2

DEPARTMENT OF COMPUTER ENGINEERING

END COURSE EXAMINATION

THEORY OF COMPUTATION

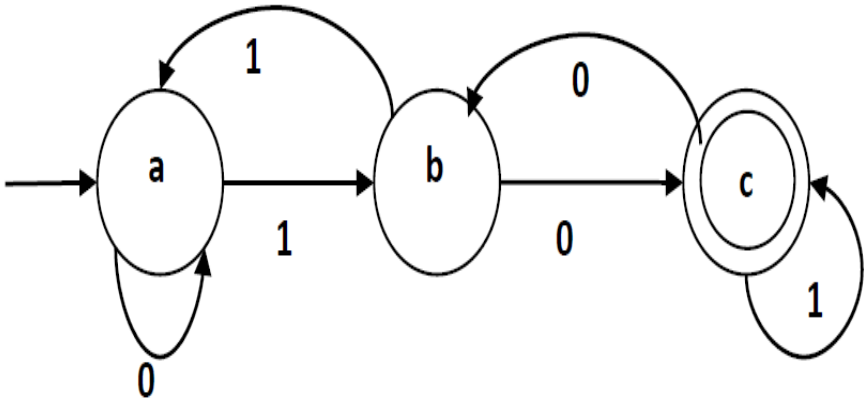
TIME : 3 HOURS **MAX MARKS : 100 MARKS**

TOTAL NO OF QUESTIONS: 7 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Convert the following Finite Automata into Regular Expression using Arden's Theorem	**[6]**	**CO3**	**L3**



	b)	Design Finite Automata which accepts all the strings over Σ = {a, b} and starting either with aa or bb and ending with b	**[8]**	**CO5**	**L4**
2	**a)**	Design Finite Automata to illustrate the working of ATM Machine	**[4]**	**CO4**	**L3**
	b)	Explain the applications of Context Free Grammar	**[4]**	**CO3**	**L3**

3		Develop the Context Free Grammar for the following:	**[8]**	**CO2**	**L2**
	a)	(aa+bb)*abb(a+b)*			
	b)	Strings made up of a's and b's and containing palindromes			
	c)	$a^{2n}b^n$			
	d)	$a^nb^nc^nd^n$			
4	**a)**	Convert the following grammar into CNF S → ASA | aB A → B | S B → b | Ɛ	**[8]**	**CO3**	**L3**
	b)	Convert the following grammar into GNF S → EF | a F → BE E → a A → EF | a B → GH | b H → AG G → b	**[8]**	**CO3**	**L3**
	c)	Check whether the following grammar is ambigious or not S → S + S | S - S | S * S | S / S S → id	**[4]**	**CO4**	**L3**
5	**a)**	Design a Push Down Automata to accept all the strings made up of a's and b's containing equal number of a's and b's	**[8]**	**CO5**	**L4**
	b)	Design a Push Down Automata to accept all the strings made up of a's and b's and having palindromes	**[8]**	**CO5**	**L4**
	c)	Design a Push Down Automata to accept all the strings made up of symbols {, }, (,), [,] and containing well formed paranthesis. For example, the string {()(())} is a well formed paranthesis, the string {()(} is not a well formed paranthesis	**[8]**	**CO5**	**L4**

6	**a)**	Design a Turing Machine to find Two's Complement of a given Binary Number	**[4]**	**CO5**	**L4**
	b)	Design a Turing Machine to copy a string made up of a's and b's into other string	**[6]**	**CO5**	**L4**
	c)	Design a Turing Machine to implement the division of two unary numbers to display the quotient	**[8]**	**CO5**	**L4**
7		Justify which machine will be used to accept all the string of type $a^n b^n c^n$ and design the machine	**[8]**	**CO4**	**L3**

Seat No:

MIT ACADEMY OF ENGINEERING

COURSE CODE: IT301T **15 JANUARY 2018**

TY BTECH SEMESTER - V RE-EXAMINATION 2018-2019 EXAMINATION

CYCLE - 2

DEPARTMENT OF INFORMATION TECHNOLOGY ENGINEERING

RE-EXAMINATION

COMPUTABILITY THEORY

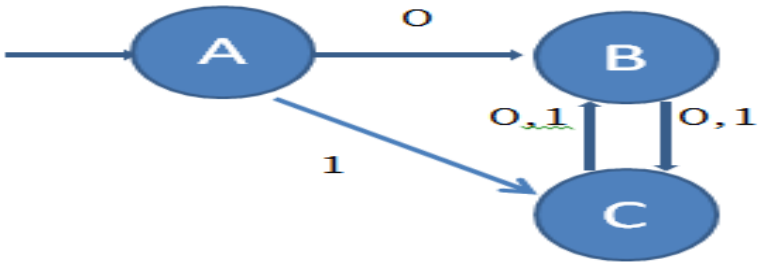
TIME : 3 HOURS **MAX MARKS : 100 MARKS**

TOTAL NO OF QUESTIONS: 12 **TOTAL NO OF PRINTED PAGES:03**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	Construct the Minimal DFA that accepts all ternary numbers which are divisible by 7 State Diagram: 06 Marks Transition Table: 02 Marks	**[08]**	**CO1**	**L2**
2	Construct the Minimal DFA that accepts all strings of a's and b's where 2nd symbol from R.H.S is a State Diagram: 06 Marks Transition Table: 02 Marks	**[08]**	**CO1**	**L3**
3	Write a Short Note on Chomsky Hirachies	**[06]**	**CO5**	**L1**
4	Design a NFA for set of all strings over {0,1} such that strings either begin or end with 01 State Diagram: 06 Marks Transition Table: 02 Marks	**[08]**	**CO1**	**L2**
5	Convert the Below State Digram to R.E Using Arden thereom	**[06]**	**CO2**	**L2**



In Above Digram A is Starting State and B is Final State

Stepwise: 01 Marks

6		Give A CFG for below Languages and R.E 1) L = { WcW^T | W belongs to {a,b}^* and W^T is reverse of W 2) L = { a^nb^m | n!=m } 3) L = {a^nb^mc^k | n=m or m<=k } 4) R.E = a^*b^* Each CFG: 02 Marks	**[08]**	**CO3**	**L2**
7		Convert the Grammar Given Below to its equivalent CNF S-->PQP P-->0P | episolon Q-->1Q | episolon Stepwise: 01 Marks	**[08]**	**CO3**	**L2**
8		Design a PDA for detection of Even palindrome State Digram: 06 Marks Transition Table: 02 Marks	**[06]**	**CO4**	**L3**
9	**a)**	Construct the PDA accepting Language L = { a^nb^ma^n | where m,n >=1 } by Null store State Digram: 06 Marks	**[06]**	**CO4**	**L3**

	b)	Convert the PDA to CFG which was created in Q.9 a)	**[06]**	**CO3**	**L2**
		Stepwise: 01 Marks			
10	**a)**	Prove the theorem E(Empty) CFG is decidable languge	**[08]**	**CO6**	**L1**
	b)	Prove that Halting Problem is undecidable	**[08]**	**CO6**	**L1**
11		Write a short note on Extension of Turing Machine	**[06]**	**CO4**	**L2**
		Each Extension Along with Digram: 02 Marks			
12		Design a TM to compute multiplication of two unary numbers Input: BB00#000#BBBBBBBBBBB Output: BB00#000#000000BBB TM Construction: 08 Marks	**[08]**	**CO4**	**L3**

Seat No:

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T **28 NOVEMBER 2018**

TY BTECH SEMESTER - V 2018 - 2019 EXAMINATION

CYCLE - 2

DEPARTMENT OF COMPUTER ENGINEERING

IN COURSE EXAMINATION

THEORY OF COMPUTATION

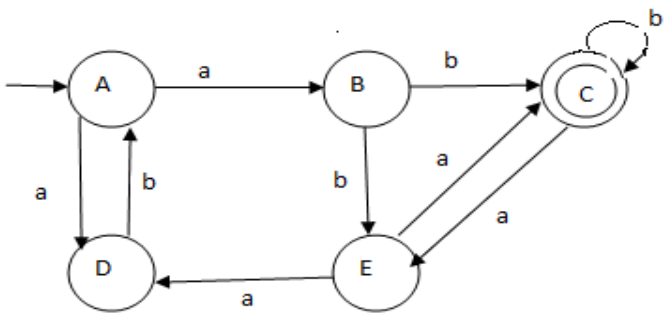
TIME : 2 HOURS **MAX MARKS : 50 MARKS**

TOTAL NO OF QUESTIONS: 4 **TOTAL NO OF PRINTED PAGES:2**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Define Complexity Theory & Compuatabilty Theory.	**[4]**	**CO1**	**L1**
	b)	Design DFA for a Language which accepts every string containing 00 as substring but not 000 as substring.	**[4]**	**CO3**	**L3**
	c)	Using proof by contradiction proove that The sum of two even numbers is always even	**[4]**	**CO1**	**L3**
2	**a)**	Design DFA for a binary number which has 101 as substring and the number is divisible by 3.	**[6]**	**CO3**	**L3**
	b)	Convert the following NFA to DFA.	**[6]**	**CO3**	**L3**



3	**a**	Design the moore machine that gives output x if string ends with aba and y otherwise. Convert it into mealy machine equivalant	**[6]**	**CO3**	**L3**

	b	Design Regular Expression for form validation in HTML. i. Date ii. Decimal number with one decimal Point	**[4]**	**CO3**	**L2**
4	**a**	Design Regular Expression for Following Language. i. L(r) ={ 0,2, 01,21,001,211,0111,2111,……} where Σ ={0,1,2} ii. $\|W_a\|$ = 2 (Mod 3) where Σ ={a,b}	**[4]**	**CO3**	**L2**
	b	Design DFA for Language $a^ib^jc^k$ where k=i+j and i>=1 and j>=1 over alphabet {a,b}.	**[6]**	**CO4**	**L5**
	c	Convert the following Regular expression into DFA for the language over alphabet {a,b}. R=(a+ba)*ba	**[6]**	**CO3**	**L3**

Seat No:

MIT ACADEMY OF ENGINEERING

COURSE CODE: CS303T **12 OCTOBER 2018**

TY BTECH SEMESTER - V 2018 - 2019 EXAMINATION

CYCLE - 1

DEPARTMENT OF COMPUTER ENGINEERING

END COURSE EXAMINATION

THEORY OF COMPUTATION

TIME : 3 HOURS **MAX MARKS : 100 MARKS**

TOTAL NO OF QUESTIONS: 6 **TOTAL NO OF PRINTED PAGES: 3**

INSTRUCTIONS TO CANDIDATES:

1. Assume suitable data wherever necessary
2. Non programmable scientific calculators are allowed
3. Black figures to the right indicate full marks

1	**a)**	Design Grammar over Σ= {0,1} which accept all the strings with palindrome	**[3]**	**CO3**	**L2**
	b)	Explain the applications of Regular Expressions	**[3]**	**CO1**	**L2**
2	**a)**	Convert the following Right Linear Grammar to Left Linear Grammar S → aA | bB | aC A → aA | a B → bB | b C → a	**[4]**	**CO3**	**L3**
	b)	Explain the applications of Context Free Grammar	**[4]**	**CO2**	**L3**
	c)	Design a context free grammar for the Regular Expression : [(aa+b)*(aa+ab+ba+bb)*]*	**[4]**	**CO3**	**L2**
	d)	Justify whether the following grammar is Ambigious or not. If yes then write its equivalent Un-Ambigious Grammar E → E + E E → E * E E → id	**[4]**	**CO2**	**L5**

	e)	Obtain the regular expressions for the following sets : 1. L1 = {b^2, b^5, b^8, b^{11}, b^{14}, ….} 2. L2 = {a^{2n+1} | n > 0}	**[4]**	**CO4**	**L4**
	f)	Design a Regular Expression to validate Password Field of Signup Page of HTML	**[4]**	**CO4**	**L4**
3	**a)**	Design a Turing Machine which will accept all the string over Σ= {a,b}* containing equal number of a's and b's	**[6]**	**CO5**	**L6**
	b)	Design PDA for the language L = $a^n b^n c^m d^m$ where m,n ≥ 1	**[6]**	**CO5**	**L6**
	c)	Construct the DFA for the NFA given below:	**[6]**	**CO3**	**L3**

State / ip	0	1
p	p,q	p
q	r	r
r	s	---
s	s	s

	d)	Consider the following two Regular Expressions : r = 0* + 1* s = 01* + 10* + 1*0 + (0*1)* i) Find the string corresponding to s but not to r ii) Find the string corresponding to both r and s iii) Find the string corresponding to neither r nor s	**[6]**	**CO1**	**L3**
4	**a)**	Design a Turing Machine find the multiplication of two unary numbers	**[8]**	**CO5**	**L6**
	b)	Convert the following grammar into GNF S → AA | AC | BD | SS A → 0 B → 1 C → SA D → SB	**[8]**	**CO4**	**L3**

c)	Convert the following grammar into CNF S → ASB A → aAS | a | ε B → SbS | A | bb	**[8]**	**CO4**	**L3**
5	Design a Turing Machine which will compare two unary numbers m and n, and produce output as G if m > n, produce output as E if m = n, produce output as L if m < n	**[10]**	**CO5**	**L6**
6	The following PDA accepts a language: $L= \{a^n b^m a^n \mid m, n \geq 1\}$. Construct equivalent CFG for L such that L(G) = L(N). $A = (\{q_0,q_1\}, \{a,b\}, \{Z, X\}, \delta, q_0, Z, \Phi\}$ Where δ is given as follows: δ(q0, a, Z) = {q0, XZ} δ(q0, a, X) = {q0, XX} δ(q0, b, X) = {q1, X} δ(q1, b, X) = {q1, X} δ(q1, a, X) = {q1, Ɛ} δ(q1, Ɛ , Z) = {q0, Ɛ}	**[12]**	**CO1**	**L1**