School of Computer Science

R16

CodeNo:134BD

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIYearIISemesterExaminations,April/May-2023 FORMAL LANGUAGES AND AUTOMATA THEORY
(CommontoCSE,IT)

Time:3Hours **Max.Marks: 75**

Note: i)Questionpaperconsists ofPartA,Part B.
ii) PartAiscompulsory,whichcarries25marks.In PartA,Answer allquestions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART–A

(25 Marks)

1.	a)	DefineKleeneClosureand Positive Closure.	[2]
	b)	WriteabouttheapplicationsofFinite Automata.	[3]
	c)	Findthesimplifiedregularexpressionforthefollowingregularexpression r(r*r+r*) +r*.	[2]
	d)	ConstructaregulargrammarforL= $\{0^n1^n1/n>=1\}$.	[3]
	e)	FortheGrammar{S→AS/a,A→SbA/SS/ba}constructLeftmostderivationforthe string aabbaaa?	[2]
	f)	Defineambiguityin CFG with an example.	[3]
	g)	Whatis the purposeof studyingTuringMachine?	[2]
	h)	Writeabout theprogrammingtechniquesforTuringMachines.	[3]
	i)	Defineundecidability.Givean exampleofanundecidableproblems.	[2]
	j)	Comparerecursiveand recursive enumerable languages.	[3]

PART–B

(50 Marks)

2. Construct NFAwith ε which accepts alanguageconsistingthestrings ofanynumberof 0's followed byanynumber of 1's followed byanynumber of 2's and also convert into NFAwithoutεtransitions. [10]

OR

3. a) DesignDFA forthefollowingover {a,b}.
i) Allstringscontainingnotmorethanthreea's.
ii) Allstringsthathasat leasttwooccurrencesofb betweenanytwooccurrencesofa.
b) ConstructaDFA acceptingthesetofallstringsendingwith 00. [6+4]

4. DesignaFAforthefollowinglanguages:
a)$(0^*1^*)^*$
b) (0+1)*111*
c) (0*11*+101). [3+3+4]

OR

School of Computer Science

5. a) ConstructaDFAforthe RegularLanguageconsistingof anynumberofa's and b's.
   b) Applypumpinglemmaforthelanguage$L=\{a^n/n\text{isprime}\}$andprovethatitisnot regular. [5+5]

School of Computer Science

6. a) DefineAmbiguousGrammar.Checkwhetherthegrammar.
S→aAB, A→bC/cd, C→cd, B→c/d is ambiguous or not?
b) ShowthatforeveryPDA thereexistsaCFGsuchthatL(G)=N(P). [5+5]

OR

7. ConstructtheCFGforthePDAM=({q_0,q_1},{0,1},{R,Z_0},δ,q_0,Z_0,Φ)andδis givenby
δ(q_0,1,Z_0)=(q_0,RZ_0)
δ(q_0,1,R)=(q_0,RR)
δ(q_0,0,R)=(q_1,R)
δ(q_1,0,Z_0)=(q_0, Z_0)
δ(q_0,ε,Z_0)=(q_0,ε)
δ(q_1,1,R)=(q_1,ε). [10]

8. a) DesignaTuringMachinefor L={$0^n1^m0^n1^m$/m,n>=1}.
b) DefineChomskyNormalForm(CNF).Convertthefollowinggrammarto CNF S→0S0|1S1|ε. [5+5]

OR

9. a) Explainfollowing:
i) Closureproperties ofContextFreeLanguages.
ii) DecisionpropertiesofContextFree Languages.
b) DesignaTuringmachinetorecognizeallstringsconsistingofodd numbers of 1's. [5+5]

10.a) Discussinbriefabout NPHardproblems.
b) Givethecorrespondencebetween P,NPandNP-complete problems. [5+5]

OR

Givean overviewofrecursivelyenumerablelanguage.
b) Explainabout the DecidabilityProblems. [6+4]

---ooOoo---

School of Computer Science

R18

CodeNo:155BK

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearISemesterExaminations,January/February-2023
FORMAL LANGUAGES AND AUTOMATA THEORY
(CommontoCSE,IT,ECM,ITE, CSE(CS))

Time:3Hours **Max.Marks: 75**

Note: i) QuestionpaperconsistsofPartA,Part B.
ii) PartAiscompulsory,whichcarries25marks. InPartA,Answer allquestions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART–A

(25 Marks)

Whatisastring? Writeaboutconcatenation oftwo strings. [2]
b) WhatisaRegularexpression inthetheoryofAutomata? [3]
c) EliminateUselesssymbolsfromthegiven grammar
A→xyz|Xyzz X→Xz|xYzY→yYy|XzZ→Zy|z [2]
d) Writethe design strategyforNFA-ε. [3]
e) Writeanytwo propertiesof Regular languages. [2]
f) WriteaboutLeftmostderivation andrightmostderivationwith example. [3]
g) DefineGNF. [2]
h) Writetheadvantagesof parsetreeinidentifyingambiguity. [3]
i) Whatdo youmeanbyInstantaneousDescriptionofTuringMachine? [2]
j) WhatisofflineTuring Machine? [3]

PART–B

(50 Marks)

2.a) DefineFiniteAutomaton. ExplainaboutthemodelofFinite Automaton.
b) Converttheregularexpression(((00)*(11)) +01)*intoanNFA. [5+5]

OR

3.a) Describeinbriefaboutapplicationsof FiniteAutomata.
b) Designamealymachinetoprint out1'scomplementofaninput bit string. [5+5]

4.a) Write the steps to construct regular expression from given DFA.
b) ConstructaNFAequivalenttotheregularexpression10(0+11)0*1. [5+5]

OR

5.a) Writeinbrief aboutthealgebraic rulesforregular expressions.
b) Discussinbriefaboutapplicationsofpumping lemma. [5+5]

6.a) Define Push Down Automata. Explain the basic structure of PDA with a neat graphical representation.
b) Constructa PDA that acceptsL=$\{0^n1^n \mid n \geq 0\}$. [5+5]

School of Computer Science

OR

7.a) ConstructaPDAwhichacceptslanguageofword overalphabet{a,b} canting {$a^i b^j c^k$/i,j,k €N, i+k=j}.

b) DefineContextFree Grammar.Stateandexplaintheclosureproperties of CFG. [5+5]

School of Computer Science

8.a) ObtainGriebechNormal Form(GNF)for:S→AB,A→BS/b,B→SA/a.

b) DefineAmbiguousGrammar?Checkwhetherthegrammar S→aAB,A→bC/cd,C→cd,B→c/d IsAmbiguousornot? [5+5]

OR

9.a) ConstructaLeftmostDerivationforthestring0011000usingthegrammar S→A0S/0/SS, A→S1A/10 ?

b) Discussinbriefaboutdecision propertiesofContextfreelanguages. [5+5]

10.a) ConstructTuringmachineforthelanguages containingthesetof allstrings ofbalanced paranthesis

b) DesignTuringmachineanditstransitiondiagramtoacceptthelanguage: L = {a ^{n} b^n| n >=1} [5+5]

OR

11.a) DefineLR(0)Grammar.Explainindetailabout PostCorrespondence Problem.

b) Whatis decidability?Explainin briefabout anytwoundecidable problems. [5+5]

---ooOoo---

School of Computer Science

R18

CodeNo:155BK

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearISemesterExaminations,August-2022
FORMALLANGUAGESANDAUTOMATATHEORY
(CommontoCSE,IT,ITE)

Time:3Hours **Max.Marks: 75**

Answer any five questions
Allquestionscarryequalmarks

DifferentiatebetweenNFAandDFA.

b) ConstructDFAfor thefollowinglanguage:
i) L={w|whasbothanevennumberof0'sandevennumberof1's}
ii) L={w|wisintheformof'x01y'forsomestringsxandyconsistingof0'sand1's}. [5+10]

DesignaMooreMachinetodeterminetheresiduemod3,whereinputistreatedas binary.

b) ConstructtheNFA acceptingthe followinglanguage:
i) Theset of all strings over ∑={a,b} startingwith theprefix"ab"
ii) Theset ofall stringsover {0,1} exceptthosecontainingthe substring"001". [7+8]

ConstructtheNFAfortheregularexpressionr= ((01+10)*00)*.

b) Whataretheclosurepropertiesofregular languages?

c) StatethePumpingLemmaforregular sets. [6+5+4]

Constructtheregularexpressionfor thelanguage overthesetS={0,1}
i) Theset of all strings containingno threeconsecutive0's.
ii) Theset ofall strings inwhich thenumberof occurrencesisdivisible by3.

b) Design NFA with epsilon for the RE=(a/b)*ab and convert it into DFA and further find theminimized DFA. [6+9]

5.a) Whatdoyoumeanbyambiguityingrammarsandlanguages?Howtoeliminated ambiguity in grammars? Explain with an example.

b) Considerthegrammar({S,A,B},{a,b},P,S)thathastheproductions:
S→bA | aB A→bAA | aS | a B→aBB | bS | b.
Findanequivalent grammarin CNF. [7+8]

6. a) Construct thePDAforthefollowinggrammar:
S→aAA, A→aS|bS|a

b) DiscusstheapplicationsofPush downAutomata. [8+7]

7. Explain the importance of Turing Machines and also give descriptions of various types ofTuring Machines with necessaryexamples. [15]

8. Discussbrieflyaboutdecidabilityandundecidabilityproblems. [15]

---oo0oo---

School of Computer Science

R18

CodeNo: 155BK

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearISemesterExaminations,February-2022 FORMAL LANGUAGES AND AUTOMATA THEORY
(CommontoCSE,IT,ITE)

Time:3hours **Max.Marks:75**

Answer any five questions
Allquestionscarryequalmarks

1.a) DesignaFAfortheLanguagewhichacceptsoddnumberof0'sandoddnumberof1's over input alphabet Σ = {0,1}.
b) ConvertthefollowingNFA intoequivalentDFA(figure1). [7+8]

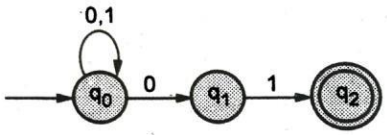


Figure1

2.a) ConvertthefollowingNFAwith € intoequivalentNFA without €(figure2).

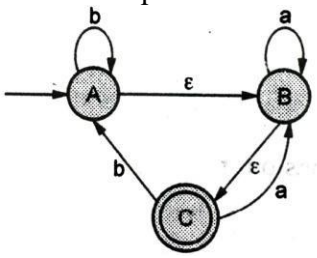


Figure2

b) DesignaMooremachinetocountnumberofb'sinagiveninputstringwitha'sand b's. [7+8]

3.a) ConstructtheFiniteAutomationtoacceptheregularexpression1*01(0+11)*.
b) Findtheminimumstate automataforthefollowingDFA(figure3). [7+8]

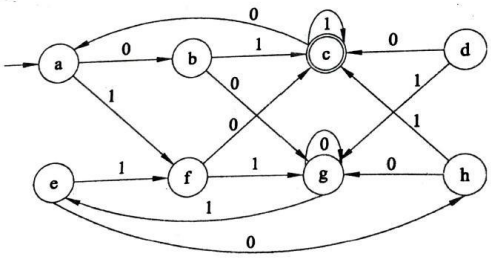


Figure3

School of Computer Science

4.a) Obtainaregularexpression forthefollowingFA(figure4).

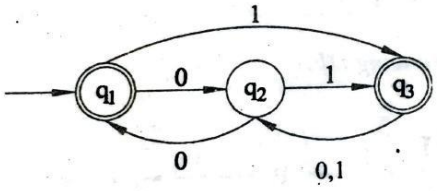


Figure4

b) CheckwhetherthefollowingtwoFSM'sareequivalentornot(figure5)? [7+8]

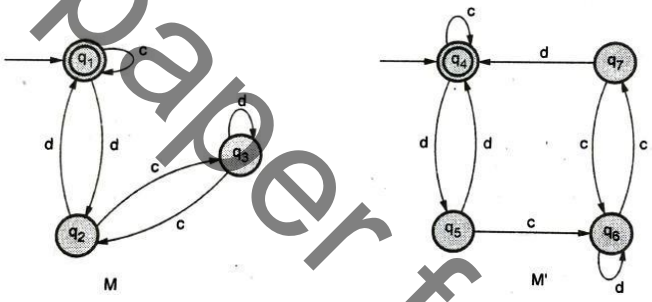


Figure5

5.a) ConstructtheContext FreeGrammarfor the LanguageL={ $0^{2n}1^{m}|n\geq 0,m\geq 0$}

b) ConstructtheCFGforthePDAM =($\{q_0,q_1\},\{0,1\},\{R,Z_0\},\delta, q_0,Z_0, \Phi$) andδisgivenby

$\delta(q_0,1,Z_0)=(q_0,RZ_0)$
$\delta(q_0,1,R)=(q_0,RR)$
$\delta(q_0,0,R)=(q_1,R)$
$\delta(q_1,0,Z_0)=(q_0, Z_0)$
$\delta(q_0,\varepsilon,Z_0)=(q_0,\varepsilon)$
$\delta(q_1,1,R)=(q_1,\varepsilon)$ [7+8]

6.a) DesignNondeterministicPDAforthelanguageL={$ww^{R}|w\varepsilon(0+1)^*$}by empty stack?

b) Showthat thefollowing grammaris ambiguousor not. [7+8]
S → AB/ aaB,
A→a/Aa,
B→b

7.a) FindtheGNFequivalenttothefollowing
S→ AA|0
A→ SS|1

b) ShowthatL={$a^nb^n c^n|n\geq 0$} isnot acontextfreelanguage. [7+8]

8.a) Giveanoverviewof recursivelyenumerablelanguage.

b) Obtainthesolution forthefollowingpost's correspondenceproblem [7+8]
A={ 100,0,1 },B ={ 1,100,00}

School of Computer Science

R16

CodeNo:134BD

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, March - 2022
FORMALLANGUAGESANDAUTOMATATHEORY
(CommontoCSE,IT)

Time:3Hours **Max.Marks:75**

Answer any five questions
Allquestionscarryequalmarks

ConstructaDFA acceptingthesetof allstringsendingwith'bb'over Σ={a,b}.
b) BrieflydiscussaboutFiniteAutomata with Epsilon- Transition.
c) Draw the transition diagram of a FA which accepts allstrings of 0's and 1's in whichthenumber of0'sareodd and1'sareeven? [5+5+5]

Showthatthe languageL ={ww |wε {a,b}*} isnot regular.
b) Writethesteps in minimization ofFA.
c) Constructfiniteautomatafortheregularexpression(1*0 +10*). [5+5+5]

3.a) DesignPushDownAutomataforthelanguage
$L=\{ww^R \mid w \varepsilon (0+1)^*\}$.
b) ConvertthefollowinggrammarintoaPDAthatacceptsthelanguagebyemptystack S →0S1|A
A→1A0|S|ε [7+8]

4.a) Eliminateε-productionsfromthegrammarGgivenas A→ aBb | bBa
B→ aB |bB |ε
b) DesignTuring Machinewhichwillrecognizestringscontaining equalnumber of0's and1's. [7+8]

5. a) Convertthefollowinggrammar toGreibach Normal Form: S→SS|0S1|01
b) ExplainDecisionpropertiesofContextFree Languages. [8+7]

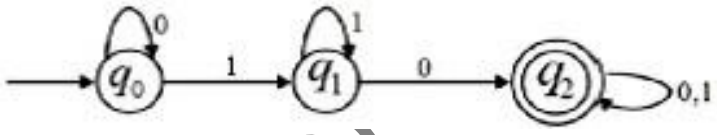
6. Writeabout thefollowing:
a) Linear-BoundedAutomata
b) Recursivelyenumerablelanguage
c) Decidabilityof PCP. [5+5+5]

School of Computer Science

7. a) Let Σ={0,1} and A, B be the list of 3 strings each. Verify if PCP given below has a solution or not?

	ListA	ListB
1	wi	xi
1	00	0
2	001	11
3	1000	011

b) Construct the Regular expression of the following Finite Automata: [7+8]



8.a) Explain about the identity rules of Regular Expressions.

b) Construct the CFG for the PDA M=({q_0,q_1},{0,1},{R,Z_0},δ,q_0,Z_0,Φ) and δ is given by:

δ(q_0,1,Z_0)=(q_0,RZ_0)
δ(q_0,1,R)=(q_0,RR)
δ(q_0,0,R)=(q_1,R)
δ(q_1,0,Z_0)=(q0,Z0)
δ(q_0,ε,Z_0)=(q_0,ε)
δ(q_1,1,R)=(q_1,ε). [7+8]

---ooOoo---

School of Computer Science

R18

CodeNo:155BK

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearISemesterExaminations,March-2021
FORMALLANGUAGESANDAUTOMATATHEORY
(CommontoCSE,IT)

Time:3Hours **Max.Marks: 75**

Answer any five questions
Allquestionscarryequalmarks

1.a) ConvertthefollowingMealyMachinein to anequivalentMooreMachine.(figure1)

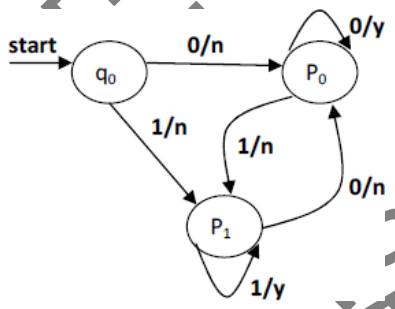


Figure1

b) ConvertthefollowingNFAintoequivalent DFA. [8+7]

δ	0	1
→q0	{q0,q1}	q1
(q1)	Φ	{q0,q1}

2.a) ConstructMoorefortheinputfrom(0+1)*thatgiveresiduemodulo4ofinputtreated as binary.

b) Constructtheminimumstateautomataequivalenttothefollowing.(figure 2) [7+8]

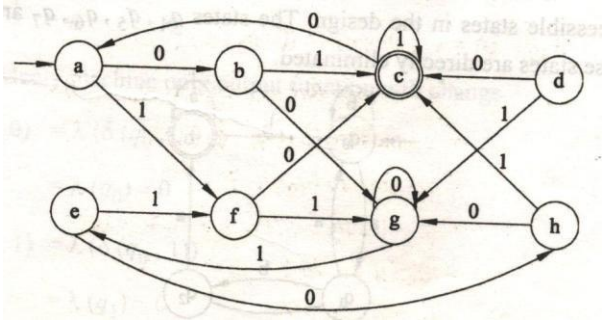


Figure2

Describethefollowingsets byregular expressions.

i) Thesetofallstringsofa‟sandb‟sbeginningwith„aa‟
ii) Thesetofallstringsofa‟sandb‟sbeginningwith„b‟andendingwith„aa
iii) Thesetofallstringsofa‟sandb‟swithatleasttwoconsecutivea‟s

School of Computer Science

b) Statepumpinglemmaforregularlanguages.Provethatthefollowinglanguage {a^n|nis a prime number} is not a regular. [8+7]

4.a) ConstructtheNFAwithεtransitionforthefollowingexpression(0+1)*00(0+1)*

b) Construct theregularexpressionforthefollowingfiniteautomata.(figure3) [8+7]

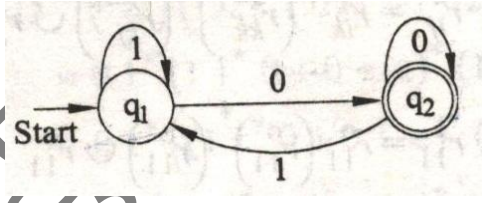


Figure3

5.a) FindCFGforthelanguage L={$a^i b^j c^k$|i=j}.

b) LetGbethegrammarS→aB|bA,A→a|aS|bAA,B→b|bS|aBB.FindaRight mostderivationforthestring"aaabbabbba"andalso drawthederivation Tree. [8+7]

6.a) DesignaPDAfor thefollowinglanguage L={^{n2n}/ $n_{\geq}1$}.

b) ConstructtheCFGforthePDAM=({q_0,q_1},{0,1},{R,Z_0},δ,q_0,Z_0,Φ)andδis given by [7+8]

$\delta(q_0,1,Z_0)=(q_0,RZ_0)$
$\delta(q_0,1,R)=(q_0,RR)$
$\delta(q_0,0,R)=(q_1,R)$
$\delta(q_1,0,Z_0)=(q_0,Z_0)$
$\delta(q_0,\varepsilon,Z_0)=(q_0,\varepsilon)$
$\delta(q_1,1,R)=(q_1,\varepsilon)$

7.a) ConvertthefollowinggrammartoGreibachNormalForm.

S→ABA | AB | BA | AA | B
A→aA|a
B→bB|b

b) Reduce the following grammar such that there are no unit productions. [8+7]

S → AA
A→ B |BB
B→ abB |b|bb

8.a) DesignaTuringMachine toacceptthelanguageL={ $_{WCW}{}^{R}$ / w in(0+1)*}.

b) DiscussaboutPostCorrespondence Problem. [8+7]

---ooOoo---

School of Computer Science

R18

CodeNo:155BK

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearISemesterExaminations,September-2021 FORMAL LANGUAGES AND AUTOMATA THEORY
(CommontoCSE,IT)

Time:3Hours **Max.Marks: 75**

Answer any five questions
Allquestionscarryequalmarks

1.a) ConvertthefollowingNFAto DFA

State	a	b
Q_0	Q_0	Q_1
Q_1	Q_0	$\{Q_0,Q_1\}$
Q_2	Q_0	Q_3
Q_3^*	Q_0	---

b) Construct a DFA to accept the binary strings consisting of even number of 0's and odd numberof 1's. [8+7]

2.a) Constructa DFA toacceptthebinarystrings divisibleby 5.
b) Eliminatethe €-transactionsof thefollowingNFA. [7+8]

State	a	b	€
Q_0	Q_0	Q_1	Q_2
Q_1	Q_1	Q_2	Q_3
Q_2	Q_2	Q_3	
Q_3^*	Q_0	---	

3.a) ProvethatRegular Languagesareclosedunder i) Reverseii)Union.
b) Identifythe regular expression acceptedbythefollowingDFA. [7+8]

State	a	b
Q_0	Q_2	Q_1
Q_1	$Q_{3,}$	Q_2
Q_2	Q_0	Q_3
Q_3^*	--	---

4.a) ProvethatL={WW^r/ Wis a binarysting}is not regular language.
b) ConstructaDFA acceptinglanguagerepresented by(0+1)*(00+11) (0+1)*. [7+8]

5.a) ConstructaPDAtoacceptthebinarystringsconsistsofnumberof0's notequalto number of 1's.
b) Construct a PDA to accept the language generated by the following CFG. [7+8]

S→Aab
A→Aab|b

School of Computer Science

6.a) ConstructaPDAto acceptthefollowinglanguageL={$a^n b^n$/n>0}.

b) Construct a CFG to generate the binary strings consisting the number of 0's is equal to thetwicethe number of1's. [8+7]
ex: 010,001010

7.a) Convertthefollowinggrammar into CNF.
S→aSa|bSb|a|b|aa|bb

b) SimplifythefollowingCFG
S→aA|aBB
A→ Aaa|€
B→bB|bbC
C→b [8+7]

8.a) ConstructTuringMachinetoacceptfollowinglanguageandgiveitsstateTransition table and diagram. Check the machine by tracing a suitable instance.
L={$a^n b^n c^n$|n ≥ 1}.

b) DesignaTM whichsubtracts two unarynumbers. i.e m-n wherem>=n. [7+8]

---ooOoo---

School of Computer Science

R16

CodeNo:134BD

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIYearIISemesterExaminations,July/August-2021 FORMAL LANGUAGES AND AUTOMATA THEORY
(CommontoCSE,IT)

Time:3hours **Max.Marks:75**

Answer any five questions
Allquestionscarryequalmarks

1.a) DefineFiniteAutomata.Explainabout themodelofFiniteAutomata.
b) DesignaNFA forthefollowinglanguage L={0101^{n}wheren>0}. [7+8]

2.a) ConstructMinimum stateAutomataforthefollowingDFA.
*denotesfinal state

Δ	0	1
→q1	q2	q3
q2	q3	q5
*q3	q4	q3
q4	q3	q5
*q5	q2	q5

b) Explain in detailabout Melayand MooreMachines. [8+7]

3.a) ConstructFiniteAutomatafortheregularExpression1(01+10)*00?
b) ExplainabouttheClosureProperties ofRegular sets. [8+7]

4.a) Showthat L={a^{2n}/n<0}is Regular.
b) ConstructaNFA equivalenttothe regularexpression10(0+11)0*1. [7+8]

5.a) ConstructaPDAforL={wcw^R/wϵ(0+1)*}
b) Explainin briefabout decision properties ofcontext freelanguages. [7+8]

6.a) DefineTuringMachine.Explain abouttheModelof Turing Machine.
b) ObtaintheChomskynormal ofthe followinggrammar E→E+T/T, T→a/CE. [7+8]

7.a) Construct Turing machine for the languages containing the set of all strings of balanced paranthesis?
b) Discussinbriefabout "churchhypothesis". [8+7]

8.a) Whatisdecidability?Explaininbrief aboutanytwoundecidableproblems.
b) ExplainaboutUniversalTuringMachine. [8+7]

---ooOoo---

School of Computer Science

R16

CodeNo:134BD

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIYearIISemesterExaminations,November/December-2020 FORMAL LANGUAGES AND AUTOMATA THEORY
(CommontoCSE,IT)

Time:2 Hours **Max.Marks: 75**

Answer any Five QuestionsAllQuestionsCarryEqualMarks

1.a) DrawthetransitiondiagramforaNFAwhichacceptsallthestringswitheithertwo consecutive 0's or two consecutive 1's.
b) DefineNFA withEpsilon moves. [8+7]

2.a) Writethe propertiesoftransition function.
b) ConstructDFAacceptingthesetofallstringswithatmostonepairofconsecutive0's andatmost onepair of consecutive1's. [7+8]

3.a) Convertregularexpression01*+1tofiniteautomata. What
b) are the properties of regular expressions? [7+8]

4.a) WhataretheclosurepropertiesofRegularLanguages? Explain.
b) Write about the applications of Regular expressions. [7+8]

5. Discussabout:
a) ContextFree Grammar
b) LeftMost Derivation
c) RightMostDerivation. [5+5+5]

6.a) Whatisunrestrictedgrammar?Givean example.
b) Explainthelanguage generated byunrestrictedgrammar. [7+8]

7. WritetheproceduretoconvertCFGtoPDAandalsoconvertthefollowingCFGtoPDA. S→ B | aAA
A→ aBB |a
B→ bBB|A
C→a [15]

8.a) Define theclassesPandNPproblems.AlsowritebriefnoteonNP-CompleteandNP- Hard Problems.
b) Explainaboutpostcorrespondence problem. [8+7]

---ooOoo---

School of Computer Science

R16

CodeNo:134BD

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May - 2019
FORMALLANGUAGESANDAUTOMATATHEORY
(CommontoCSE,IT)

Time:3Hours **Max.Marks: 75**

Note: ThisquestionpapercontainstwopartsAandB.
PartAiscompulsorywhich carries25marks. Answer allquestionsinPartA.
PartBconsistsof5Units.Answeranyonefullquestionfromeachunit.Each question carries 10 marks and may have a, b as sub questions.

PART–A

(25 Marks)

1. a) DefineKleeneClosureand Positive Closure? [2]
   b) DefineMooreMachine? [3]
   c) DefineaRegular Expression. [2]
   d) Findthesimplifiedregularexpression forthe followingregularexpression r(r*r +r*)+r*? [3]
   e) DefineContextFree Grammar. [2]
   f) DefinePushDownAutomata. [3]
   g) DefineTuringmachine. [2]
   h) What is ChomskyNormalForm? [3]
   i) Whatisundecidableproblem? [2]
   j) Comparerecursiveandrecursiveenumerable languages. [3]

PART–B

(50 Marks)

2. Construct NFA with ε which accepts a language consisting the strings of any number of 0's followed by any number of 1's followed by any number of 2's And also convert into NFA without ε transitions. [10]

OR

3. Construct the Moore machine to determine residue mod 3 and convert into Mealy machine. [10]

4. a) Testwhetherthefollowingtwo FSM'sareequivalent.

M1	0	1
→ A	B	D
(B)	A	C
C	D	B
(D)	C	A

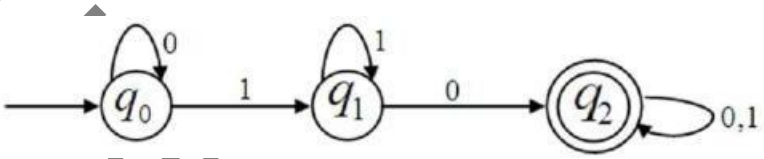
M2	0	1
→ P	R	R
Q	R	P
(R)	P	Q

School of Computer Science

b) Applypumpinglemmaforthelanguage$L=\{a^n/n$ is prime$\}$and provethatitisnot regular? [5+5]

OR

5. Construct the regular expression corresponding to the language accepted by following DFA. [10]



6. a) Elaborateonleftmostderivationandrightmostderivation.
b) Design Push down AutomataforL=$\{a^{2n}b^n|n \geq 1\}$3. [5+5]

OR

7. Construct theCFG forthePDAM = $(\{q_0,q_1\}, \{0,1\}, \{R,Z_0\}, \delta, q_0, Z_0, \Phi)$and δis given by
$\delta(q_0,1,Z_0)=(q_0,RZ_0)$
$\delta(q_0,1,R)=(q_0,RR)$
$\delta(q_0,0,R)=(q_1,R)$
$\delta(q_1,0,Z_0)=(q_0,Z_0)$
$\delta(q_0,\varepsilon,Z_0)=(q_0,\varepsilon)$
$\delta(q_1,1,R)=(q_1,\varepsilon)$. [10]

8.a) Listout anddiscuss theclosurepropertiesof CFL.
b) ConstructCFGwithoutε–productionfromtheonewhichisgivenbelow S → a | Ab | aBa
A→ b|ε
B→ b|A [5+5]

OR

9. DesignaTuringMachine toacceptL=$\{WcW^R|W$ is in $(a+b)^*\}$. [10]

10. a) Discussin briefabout NPHard problems.
b) Discusstheexamplesofundecidableproblems. [5+5]

OR

11. a) Explainabout theundecidableproblems about turing machines.
b) DistinguishbetweenclassPand classNPProblems. [5+5]

---ooOoo---

NARSIMHA REDDY ENGINEERING COLLEGE
UGC-AUTONOMOUS INSTITUTION
An Autonomous Institute
NAAC Accreditation 'A' Grade
Accredited by NBA
Approved by AICTE, Affiliated to JNTUH

School of Computer Science

R16

CodeNo:134BD

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, April - 2018
FORMALLANGUAGESANDAUTOMATATHEORY
(CommontoCSE,IT)

Time:3Hours **Max.Marks: 75**

Note: ThisquestionpapercontainstwopartsAandB.
PartAiscompulsorywhichcarries25marks.AnswerallquestionsinPartA. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(25 Marks)

DefineDFA. [2]
b) WriteabouttheapplicationsofFiniteAutomata? [3]
c) IfaRegulargrammarGis givenbyS→aS/aFindDFA (M)acceptingL(G)? [2]
d) ConstructaregulargrammarforL= {$0^n11/n>=1$}. [3]
e) FortheGrammar{S→AS/a,A→SbA/SS/ba}constructLeftmostderivationforthe string aabbaaa? [2]
f) DefinePushDownAutomata. [3]
g) Whatis the purposeofstudyingTuringMachine? [2]
h) WriteaContextfreegrammarforthelanguage{$0^n1^n/n>=1$}. [3]
i) Givean exampleof un decidableproblem. [2]
j) DefinePostcorrespondence Problem. [3]

PART-B

(50 Marks)

2.a) ConstructMinimumstateAutomataforthefollowingDFA?
*denotesfinal state

δ	0	1
→Q1	q2	q6
q2	q1	q3
*q3	q2	q4
q4	q4	q2
q5	q4	q5
*q6	q5	q4

b) DifferentiatebetweenNFAandDFA. [6+4]

OR

DesignDFA forthefollowingover {a,b}.
i) Allstringscontainingnotmorethanthreea's.
ii) Allstringsthathasat leasttwooccurrencesofb betweenanytwooccurrencesofa.

School of Computer Science

b) ConstructaDFA acceptingthesetofallstringsendingwith 00? [5+5]

4.a) DefineRegularExpression?ExplainaboutthePropertiesofRegularExpressions.
b) ConstructaDFAforthe RegularLanguageconsistingof anynumberofa's and b's. [5+5]

OR

5.a) ConstructaDFA forthe Regularexpression$(0+1)^*(00+11)(0+1)^*$.
b) Explainabout theidentityrules of Regular Expressions. [5+5]

6.a) Define Ambiguous Grammar. Check whether the grammar.
S→aAB,A→bC/cd,C→cd,B→c/dIsAmbiguousornot?
b) ConstructaPDAforthe followinggrammarS→AA/a, A→SA/b. [5+5]

OR

7.a) Showthat foreveryPDAthereexists a CFG suchthatL(G)=N(P).
b) Convert the grammar S→0AA, A →0S/1S/0 to a PDA that Accepts the same Language by Empty Stack. [5+5]

8.a) Construct a Turing Machine that will accept the Language consists of all palindromes of 0's and1's?
b) ExplainabouttypesofTuring Machine. [5+5]

OR

9.a) ObtainGNF forS→AB,A→BS/b,B→SA/a.
b) Design aTuringMachinefor $L=\{0^n1^m0^n1^m/m,n>=1\}$. [5+5]

10.a) Discussin briefaboutNP Hard problems.
b) Explain aboutthe DecidabilityandUndecidability Problems. [5+5]

OR

11.a) Giveanoverviewof recursivelyenumerablelanguage.
b) Givethe correspondence between P, NPand NP-complete problems. [5+5]

---ooOoo---

School of Computer Science

R16

CodeNo:134BD

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIYearIISemesterExaminations,December-2018
FORMAL LANGUAGES AND AUTOMATA THEORY
(CommontoCSE,IT)

Time:3Hours **Max.Marks:75**

Note: Thisquestion papercontainstwopartsAandB.
PartAiscompulsorywhich carries25marks. Answer allquestionsinPartA.
Part B consists of 5 Units. Answer any one full question from each unit. Each questioncarries 10 marks and may have a, b, c as sub questions.

PART-A

(25Marks)

	Definethe centralconceptsofAutomataTheory.	[2]
b)	Writedowntheapplicationsoffinite automata.	[3]
c)	Constructaregulargrammarfor$L= \{0^n11/n\geq 1\}$.	[2]
d)	Explainthe applicationsofthe pumpinglemma.	[3]
e)	Defineambiguityin CFG with an example.	[2]
f)	Writeshortnotes onParse Trees.	[3]
g)	Construct CFG togenerate stringwithanynumbers of1's.	[2]
h)	Writeabout theprogrammingtechniques forTuringMachines.	[3]
i)	Defineundecidability. Giveanexampleof anundecidableproblems.	[2]
j)	Writeshort noteon NP-hard problem.	[3]

PART-B

(50 Marks)

DifferentiatebetweenNFAandDFA.

b) Design DFA forthefollowingover{a,b}
i) Allstringscontainingnot morethan threea's.
ii) Allstringsthathasat leasttwooccurrencesofb betweenanytwooccurrencesofa. [5+5]

OR

3.a) Explainthe procedurefor convertingDFA to NFA.
b) Brieflydiscussabout Finite Automatawith Epsilon- Transitions. [5+5]

4. a) DefineRegularExpression?Explainaboutthepropertiesof RegularExpressions.
b) ConstructaDFAforthe Regularexpression$(0+1)^*(00+11)(0+1)^*$. [5+5]

OR

5. DesignaFAforthe followinglanguages
a)$\left(0^*1^*\right)^*$
b) $(0+1)^*111^*$
c) (0*11* +101) [10]

School of Computer Science

6.a) Convertthefollowinggrammartoa PDAthatacceptsthelanguagebyemptystack S → 0S1|A
A→ 1A0|S|€.

b) ShowthatforeveryPDA thereexistsa CFGsuchthatL(G)=N(P). [5+5]

OR

Deriveleftandrightmostderivationsfortheinputstringa=b*c+d/eforthegiven Grammar.
E→E+E|E-E|E*E
E→E/EE→(E)|id

b) Explainthefollowingswithexamples.
i) Sentential Forms
ii) DeterministicPushdown Automata. [5+5]

8.a) DesignaTuringMachine toacceptthelanguageL={wcw^R|w∈(a+b)*}.

b) DefineChomsky Normal Form (CNF). Convert the following grammar to CNF
S→0S0|1S1|∈ [5+5]

OR

Explainfollowing:
i) Closureproperties ofContext FreeLanguages.
ii) Decisionpropertiesof ContextFree Languages.

b) DesignaTuringmachine to recognizeallstringsconsistingof oddnumbersof1's.[5+5]

10.a) Writethepropertiesofrecursive and non-recursive enumerablelanguages.

b) Letἐ={0,1}andA,Bbethelistof3stringseach.VerifybelowPCPhasasolutionor not? [5+5]

	ListA	ListB
1	wi	xi
1	00	0
2	001	11
3	1000	011

OR

11.a)Givethe correspondence between P,NPand NP-complete problems.

b)Definepost`s correspondenceproblemand showthatit is undecidable. [5+5]

---ooOoo---