Department Of Computer Science and Engineering

Previous Question Papers

CodeNo:134BD **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD
B.Tech IIYear IISemester Examinations, December-2019
FORMAL LANGUAGES AND AUTOMATA THEORY
(Common to CSE,IT)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, bas sub questions.

PART–A

(25Marks)

1.a)	Define Non-deterministic Finite Automata.	[2]
b)	What is the mathematical model of finite automata?	[3]
c)	What are the Applications of the Pumping Lemma?	[2]
d)	What are the Decision Properties of Regular Languages?	[3]
e)	Define context free grammar.	[2]
f)	Define Push down Automaton.	[3]
g)	Define Chomsky Normal Form.	[2]
h)	What is Restricted Turing Machines?	[3]
i)	Define NP-complete problem.	[2]
j)	Give examples for undecidable problems.	[3]

PART–B

2. Design a DFA which accepts set of all strings which are divisible by5for binary alphabet. [10]

OR

3. Illustrate an example to explain the process used to convert non- deterministic automata to deterministic automata? [10]

4. Convert regular expression (01^*+1) to finite automata. [10]

OR

5. a) Prove that regular set $L=\{1^p/p \text{ is a prime}\}$ is not regular.
   b) Explain about Pumping Lemma. [5+5]

6. Construct a PDA that accepts the language $L=\{WCW^R \mid W\in(a+b)^*\}$ [10]

OR

7. a) Explain about Ambiguity in Grammars and Languages with example.
   b) Discuss in detail about left most and right most derivation tree with example. [10

8. Design a Turing machine over $\Sigma=\{a, b\}$ to accept the language $L=\{WW^R \mid W\in(a, b)^+\}$.[10]

OR

9.a) Construct PDA from the following
CFG
$S\rightarrow aAA$
$A\rightarrow aS|bS|a$
   b) Explain Closure Properties of Context-Free Languages. [10]

10.a) Explain Decision Properties of Context-Free Languages.
   b) Explain the concepts of Undecidable Problems about Turing Machines. [4+6]

OR

11.a) Discuss in detail about P and NP problems.
   b) Explain about Post's Correspondence Problem with an example. [4+6]

---ooOoo---

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSIT YHYDERABAD
B.Tech IIYear IISemester Examinations, December-2018
FORMAL LANGUAGES AND AUTOMATATHEORY
(Computer Science and Engineering)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
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

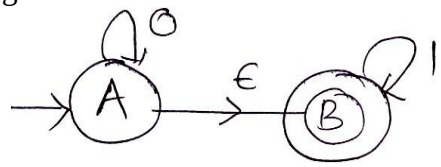
(25Marks)

1.a)	Define DFA.	[2]
b)	Design FA which accepts s set of all strings endingwith00.	[3]
c)	Define Left linear Grammar.	[2]
d)	Give the regular expression for the language all string over alphabet **{0,1}** Containing at least two 0's.	[3]
e)	What is ambiguity in CFG?	[2]
f)	Write the context free grammar for the language **L={$a^n b^{2n}$/n≥1}**	[3]
g)	Give Instantaneous description ID of Turing Machine.	[2]
h)	DefineType0Grammar.	[3]
i)	List any2 NP Hard Problems.	[2]
j)	Define Turing reducibility. [3]	

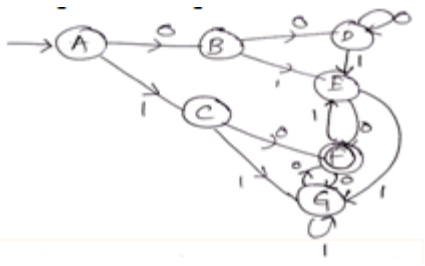
PART-B

50Marks

2 a) Convert the following NFA with € -moves to DFA shown in figure.



b) Minimize the following DFA shown in figure. [5+5]



1. Check whether the following two Finite Automaton's are equivalent or not?
   Finite Automaton (FA)1(figure3):

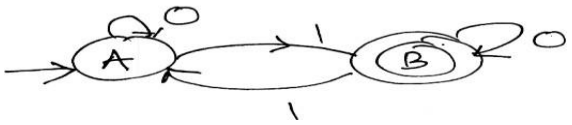


Figure:3

FiniteAutomaton(FA)2(figure4):

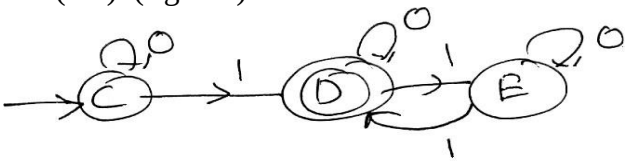


Figure:4

b) Convert the following NFA with Є moves toDFAinfigure5. [5+5]

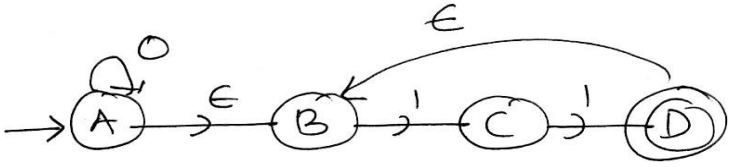


Figure:5

4.

ConstructanNFAforthefollowingRegularexpression:a)01[((10
)*+111)*+0]*1
b) ((01+10)*00)* [5+5]

OR

5.a) Find the regular grammar for the following Finite Automate shown in figure6.

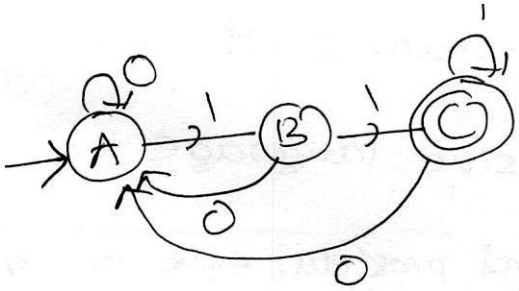


Figure:6

b) Construct FA for the following regular expressions (0+1)*(1+00)(0+1)*. [5+5]

6.a) Convert the following grammar to Chomsky Normal Form
S→ABA
A→aA | Є
B→bB|Є
And simplify the grammar

b) Write and explain closure properties of Context Free Languages. [5+5]

OR

7. a) State the Pumping Lemma for Context Free Languages.

b) Design Push down Automata for the language **L= {$a^n b^{2n}$|n≥1}.** **[5+5]**

8.a) Design Turing Machine for the Language L={**$a^n b^n c^n$/n≥1**}

b) List the Closure properties of recursive Languages. [6+4]

OR

9.a) Design Turing Machine to compute the function n!

b) Design TM for performing proper subtraction of two numbers. [5+5]

10.a) Briefly write about Universal Turning Machine (UTM).

b) What do you mean by NP Complete? List any 6 NP Complete Problems. [4+6]

OR

11.a) Discuss about turing Reducibility.

b) Write about:

i) Post Correspondence Problem

ii) Halting problem of TM. [3+7]

---ooOoo---

Code No: 114AG

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, May - 2017

FORMAL LANGUAGES AND AUTOMATA THEORY

(Computer Science and Engineering)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
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)

1.a) Define Transition Table. [2]
b) Explain the difference between DFA and NFA. [3]
c) Construct CFG to generate strings with any number of 1's. [2]
d) Explain Leftmost Derivation with an example. [3]
e) Construct $L=\{a^m b^m c^n \mid m, n \geq 1\}$ [2]
f) Define A an example. [3]
g) Explain a [2]
h) Write a short note on Recursive languages. [3]
i) List the properties of type-3 grammar. [2]
j) Define Context-sensitive grammar. [3]

PART-B

Marks)

number of 0's followed by any number of 1's followed by any number of 2's.

b) Check whether the following two FSM's are equivalent. [5+5]

M1	0	1
→ A	B	D
	A	C
C	D	B
	C	A

M2	0	1
→ P	R	R
Q	R	P
(R)	P	Q

OR

3.a) Define Moore and Mealy machines with examples.
b) Design FA to accept string with 'a' and 'b' such that the number of a's are divisible by 3. [5+5]

4.a) Construct the left linear grammar for the language (0+1)*00(0+1)*.
b) Apply pumping lemma for the language $L=\{a^n/n$ is prime$\}$ and prove that it is not regular [5+5]

OR

5. Design a FA for the following Languages
   a) (0*1*)*
   b) (0+1)*111*
   c) (0*11*+101). [3+3+4]

6.a) Find the GNF equivalent to the following
   S → AA | a
   A → SS | b
   b) Convert the following grammar to a PDA that accepts the language by empty stack
   S→0S1|A
   A→1A0|S|ε. [5+5]

OR

7.a) Eliminate Useless symbols from the following grammar
   S → aA | a | Bb | cC
   A → aB
   B → a | Aa
   C → cCD
   D → ddd
   b) Construct 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
   $\delta(q_0,1,Z_0)=(q_0,RZ_0)$
   $\delta(q_0,1,R)=(q_0,RR)$
   $\delta(q_0,0,R)=(q_1,R)$
   $_1$,0, Z_0)=(q_0,
   Z_0)=(

8.a) Design a Turing Machine to accept L={WW^R | W is in (a+b)*}.
   b) Design a TM to recognize the language L= {$1^n2^n3^n$ | n ≥ 1}. [5+5]

OR

9.a) Design TM which will recog containing equal number of 0's and 1's.
   b) Design TM that accepts the l *. [5+5]

10.a) Explain Chomsky hierarchy of Languages.
   b) Write short note on NP- hard and NP-complete problem. [5+5]

OR

11.a) Discuss about universal turing Machine.
   b) Define post's correspondence problem and show that it is undecidable. [5+5]

---ooOoo---

Q.P Code: CS3101PC

Hall Ticket No.:

NARSIMHAREDDY ENGINEERING COLLEGE
(UGC AUTONOMOUS)

III B.Tech I Semester (NR20) Supplementary Examination, December 2023 / January 2024

FORMAL LANGUAGES AND AUTOMATA THEORY

(Computer Science and Engineering)

Time : 3 hours **Maximum marks: 75**

Note:
- This question paper contains two parts, A and B
- Part A is compulsory which carries 25 marks (1st 5 sub questions are one from each unit carry 2 Marks each & Next 5 sub questions are one from each unit carry 3 Marks). Answer all questions in Part A
- Part B Consists of 5 Units. Answer one question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A **(25 Marks)**

Answer all questions

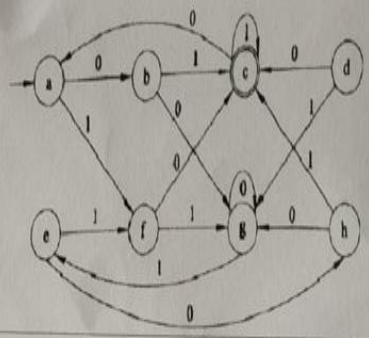
Q.No		Question	M	CO	BL
1)	a.	What is a string? Write about concatenation of two strings.	2	CO1	L1
	b.	Define DFA.	2	CO1	L1
	c.	Write the design strategy for NFA-ε.	2	CO2	L2
	d.	If a Regular grammar G is given by S→aS/a Find DFA (M) accepting L(G)?	2	CO2	L2
	e.	Write any two properties of Regular languages.	2	CO3	L1
	f.	Define Push Down Automata.	3	CO3	L1
	g.	Write the advantages of parse tree in identifying ambiguity.	3	CO4	L1
	h.	Write a Context free grammar for the language $\{0^n1^n/n>=1\}$.	3	CO4	L2
	i.	What do you mean by Instantaneous Description of Turing Machine?	3	CO5	L1
	j.	Give an example of un decidable problem.	3	CO5	L2

Part-B **(50 Marks)**

Answer all the Units

All Questions carry equal Marks

Q.No		Question	M	CO	BL
		UNIT–I			
2)	a.	Differentiate between NFA and DFA.	5	CO1	L2
	b.	Define Finite Automaton. Explain about the model of Finite Automaton.	5	CO1	L3
		OR			
3)	a.	Construct the NFA accepting the following language: i) The set of all strings over Σ = {a,b} starting with the prefix "ab" ii) The set of all strings over Σ = {0,1} except those containing the string "001"	5	CO1	L3
	b.	Design a mealy machine to implement of an input bit string.	5	CO1	L4

		UNIT–II			
4)	a.	Write the steps to construct regular expression from given DFA.	5	CO2	
	b.	Construct the Finite Automation to accept the regular expression 1*01(0+11)*.	5	CO2	
		OR			
5)	a.	Discuss in brief about applications of pumping lemma.	5	CO2	
	b.	Find the minimum state automata for the following DFA below figure 	5	CO2	
		UNIT–III			
6)	a.	Construct the PDA for the following grammar: S→aAA, A→aS | bS | a	5	CO3	
	b.	Design Non deterministic PDA for the language L={ WW^R | W ε(0+1)* } by empty stack?	5	CO3	
		OR			
7)	a.	Consider the grammar ({S,A,B}, {a,b}, P, S) that has the productions: S→bA | aB A→bAA | aS | a B→aBB | bS | b Find an equivalent grammar in CNF.	5	CO3	
	b.	Define Push Down Automata. Explain the basic structure of PDA with a neat graphical representation.	5	CO3	
		UNIT–IV			
8)	a.	Convert the following grammar into CNF. S→aSa | bSb | a | b | aa | bb	5	CO4	
	b.	Discuss in brief about decision properties of Context free languages.	5	CO4	
		OR			
9)	a.	Obtain Griebech Normal Form (GNF) for: S→AB, A→BS/b, B→SA/a.	5	CO	
	b.	Construct a Left most Derivation for the string 0011000 using the grammar S→A0S/0/SS, A→S1A/10 ?	5	CO	
		UNIT–V			
10)	a.	Design a Turing Machine to accept the language L={ WCW^R / w in (0+1)*}.	5	CO	
	b.	Design a TM which subtracts two unary numbers. i.e m-n where m>=n.	5	CO	
		OR			
11)		Discuss briefly about decidability and undecidability problems.	10	CO	

--oOo--

Q.P Code: CS3101PC Hall Ticket No.:

NARSIMHAREDDY ENGINEERING COLLEGE
(UGC AUTONOMOUS)

III B.Tech I Semester (NR21) Supplementary Examination, November 2025
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time : 3 hours **Maximum marks: 70**

Note:
- This question paper contains two parts, A and B
- Part A is compulsory which carries 20 marks (10 sub questions are two from each unit carry 2 Marks). Answer all questions in Part A
- Part B Consists of 5 Units. Answer one question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A **(20 Marks)**
Answer all questions

Q.No		Question	M	CO	BL
1)	a.	If a DFA reaches a dead state while processing a string, what does that indicate?	2	CO1	L1
	b.	Write transition diagram for DFA to accept exactly one a defined over an alphabet Σ={a,b}.	2	CO1	L1
	c.	Can every regular expression be converted into an equivalent finite automaton? Justify	2	CO2	L2
	d.	A student writes two different DFAs for the same language. Can both be minimized to the same automaton? Explain.	2	CO2	L1
	e.	Define a Context-Free Grammar (CFG).	2	CO3	L1
	f.	If a grammar generates multiple parse trees for a single string, what can you infer about the grammar?	2	CO3	L1
	g.	Can a CFG generate a language without using Ɛ-productions? Justify briefly.	2	CO4	L2
	h.	How would you differentiate between a linear bounded automaton and a Turing machine?	2	CO4	L1
	i.	How does the concept of recursive enumerability differ from decidability?	2	CO5	L1
	j.	Mention a real-world implication of undecidable problems.	2	CO5	L1

Part-B **(50 Marks)**
Answer all the Units
All Questions carry equal Marks

Q.No		Question	M	CO	BL
		UNIT–I			
2)	a.	Discuss the structural representations of finite automata. Explain the components provide examples.	5	CO1	L2
	b.	Construct a DFA equivalent to the NFA given below. 	5	CO1	L3
		OR			
3)	a.	Write and explain the steps for minimizing DFA with an example.	5	CO1	L2

	b.	Convert the following Mealy machine into its equivalent Moore machine:	5	CO1	L3

Present State	I / P = 0		I / P = 1	
	Next State	OP	Next State	OP
→ A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

		UNIT–II			
4)	a.	What is regular expression? Write the regular expression for the following languages over {0, 1}* i) The set of all strings such that number of 0's is odd ii) The set of all strings that contain exactly three 1's iii) The set of all strings that do not contain 1101	5	CO2	L2
	b.	Explain pumping lemma for regular languages with the applications of pumping lemma.	5	CO2	L3
		OR			
5)	a.	Explain the step-by-step method to generate equivalent FA for the regular expressions of different forms.	5	CO2	L3
	b.	Explain about closure properties of regular languages.	5	CO2	L2
		UNIT–III			
6)	a.	Construct Leftmost, Derivation, Rightmost Derivation, Derivation following grammar: $G=(V,T,P,S)$ with $N=\{E\}$, $S=E$, $T=\{id,+,*,(,)\}$ E→E+E E→E*E E→(E) E→id Obtain id+id*id in right most derivation, left most derivation.	5	CO3	L3
	b.	Explain the applications of context fre grammars.	5	CO3	L3
		OR			
7)	a.	Construct a PDA which accepts language of word over alphabet {a, b, c} contain $\{a^i b^j c^k / i,j,k \in N, i+k=j\}$.	5	CO3	L3
	b.	Construct the CFG for the given grammar: S→AA|a A→SA|b.	5	CO3	L2
		UNIT–IV			
8)	a.	Write the minimized CFG for the following grammar: S→ABCa|bD A→BC|b B→b|Ɛ C→D|Ɛ D→d	5	CO4	L2
	b.	Convert the following grammar into Greibach Normal Form: S→AY|XX X→x|SX Y→y A→x.	5	CO4	L3
		OR			
9)	a.	Explain about the closure properties of CFL's.	5	CO4	L3
	b.	Construct a Turing Machine for language $L=\{ww^R \mid w \in \{0,1\}\}$.	5	CO4	L3
		UNIT–V			
10)	a.	Explain about halting problem with an example.	5	CO5	L3

<table>
<tr><td></td><td>b.</td><td>Explain about the universal Turing machine.</td><td>5</td><td>CO5</td><td>L2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>11)</td><td>a.</td><td>Explain individually classes P and NP.</td><td>5</td><td>CO5</td><td>L3</td></tr>
<tr><td></td><td>b.</td><td>Write a shot notes on Post's Correspondence Problem (PCP) and check the following is PCP or not.
<table>
<tr><th>I</th><th>A</th><th>B</th></tr>
<tr><td>1</td><td>00</td><td>0</td></tr>
<tr><td>2</td><td>001</td><td>11</td></tr>
<tr><td>3</td><td>1000</td><td>011</td></tr>
</table></td><td>5</td><td>CO5</td><td>L2</td></tr>
</table>

--ooOoo--