1. **OLD 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→ aAA
A→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]

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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**

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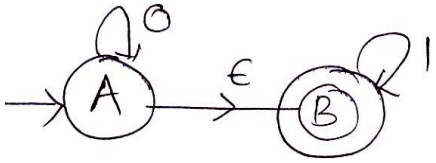
PART-A **(25Marks)**

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 **$L=\{a^n b^{2n}/n\geq 1\}$** [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):

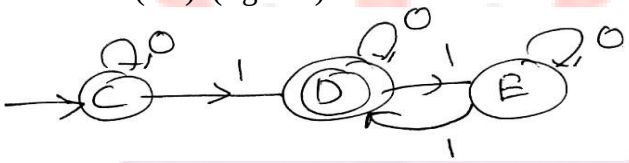


Figure:4

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

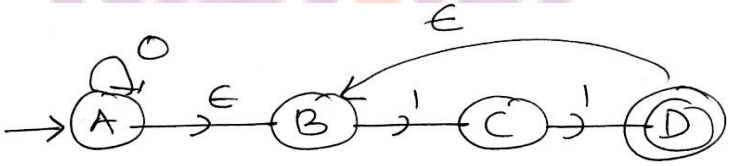


Figure:5

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.

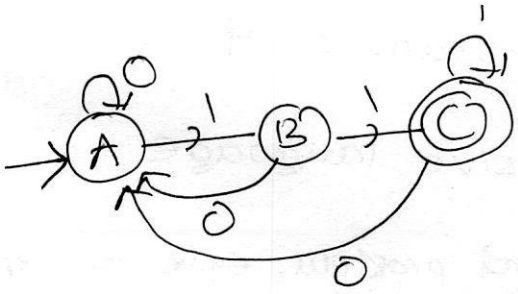


Figure:6

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= $\{a^n b^{2n} | n \geq 1\}$.** **[5+5]**

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

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---

R13

Code No: 114AG

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 $L=\{a^n/n \text{ is prime}\}$ 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
   $S \rightarrow AA \mid a$
   $A \rightarrow SS \mid b$

   b) Convert the following grammar to a PDA that accepts the language by empty stack
   $S \rightarrow 0S1|A$
   $A \rightarrow 1A0|S|\varepsilon$. [5+5]

OR

7.a) Eliminate Useless symbols from the following grammar
   $S \rightarrow aA \mid a \mid Bb \mid cC$
   $A \rightarrow aB$
   $B \rightarrow a \mid Aa$
   $C \rightarrow cCD$
   $D \rightarrow ddd$

   b) Construct CFG for the PDA $M = (\{q_0,q_1\}, \{0,1\}, \{R,Z_0\}, \delta, q_0, Z_0, \Phi)$ 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 $L=\{WW^R \mid W \text{ is in } (a+b)^*\}$.
   b) Design a TM to recognize the language $L= \{1^n2^n3^n \mid n \geq 1\}$. [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]

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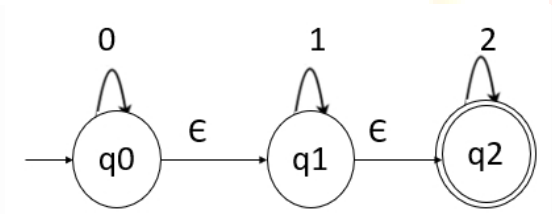
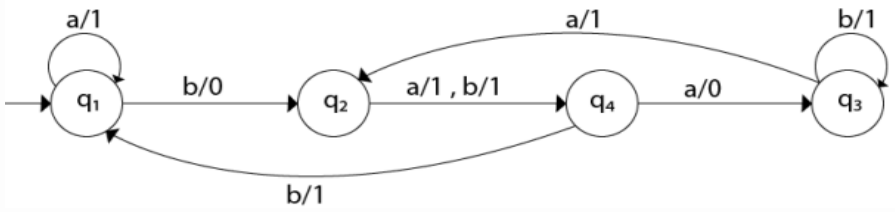
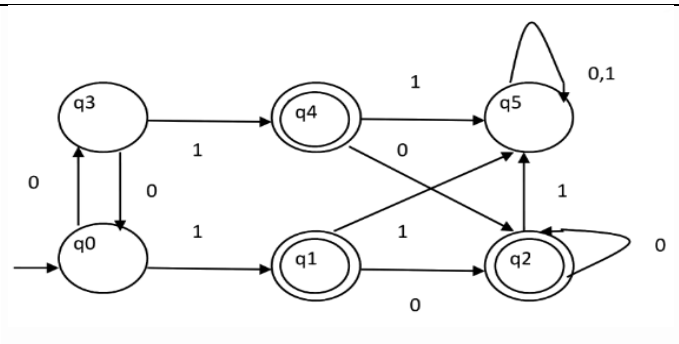
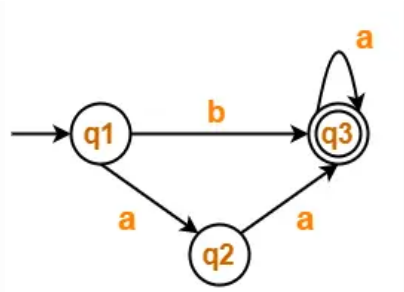
2. ASSIGNMENT QUESTIONS:

MODULE-1:

Questions	BT	CO's
1. a) Draw the block diagram of Finite Automata and explain each component b) Write any four differences between DFA and NFA?	L6	CO1
2. Construct DFA that recognizes the language **L(M)={W/W is in {a, b c}*** and W contains the pattern **abac**}	L3	CO1
3. Design a Moore machine for a binary input sequence such that if it has a substring 101, the machine output A, if the input has substring 110, it outputs B otherwise it outputs C.	L6	CO1
4. Convert the given NFA with epsilon to NFA without epsilon. 	L2	CO1
5. Convert the following Mealy machine into equivalent Moore machine. 	L2	CO1

MODULE-II:

Questions	BT	CO's
1. Minimize the following Finite Automata.	L3	CO2

		
2. Construct NFA for the following i) 0+10*+01*0 ii) (0+1)*(01+110)	L3	CO2
3. Using Pumping Lemma prove that the language L={$a^n b^n$ /n>0} is not regular.	L3	CO2
4. Derive regular expression for the following DFA using Arden's Theorem. 	L3	CO2
5. Construct regular grammar from regular expression $0^*(1(0+1))^*$.	L3	CO2

MODULE-III:

Questions	BT	CO's
1. Construct a PDA for the following L = {$a^n cb^{2n}$/n ≥ 1} over alphabet {a, b, c}.	L3	CO3
2. Construct a PDA that accepts the language generated by the following grammar. S → aB, B → bA/b, A → aB. Show an ID for the string abab for the PDA generated.	L3	CO3
3. **State** the following grammar is ambiguous. S->AB|aaB A->a |Aa B->b	L1	CO3
4. a) Obtain a CFG to generate unequal no.s of a's and b's.	L2,L3	CO3

b) Define and distinguish regular grammar and CFG?		
5. Convert the following grammar from CFG to PDA. S->AB|aaB A->a |Aa B->b	L2	CO3

MODULE-IV:

Questions	BT	CO's
1. Convert the given CFG to CNF S-> aSa| bSb | a| b	L2	CO4
2. Convert the given CFG to GNF S-> ABA A->aA|ε B-> bB|ε	L2	CO4
3. Design a Turing Machine to accept L={$1^n2^n3^n$ | n≥1}	L6	CO4
4. a) Define Turing machine and its model b) Explain the differences between PDA and T M?	L1,L2	CO4
5. Design a TM to accept L={WW^R| W€(0+1)*}	L6	CO4

MODULE-V:

Questions	BT	CO's
1) Does the following PCP problem have a solution?	L5	CO5
2) What is NP- hard and NP- Complete?	L1	CO5
3) Explain UTM?	L2	CO5
4) Write notes on Chomsky hierarchy?	L6	CO5

i	List A	List B
1	b	bbb
2	babbb	ba
3	ba	a

5) Explain the types of Turing Machine?	L2	CO5