Code No: RT22055 **R13** SET - 1

II B. Tech II Semester Regular Examinations, May/June - 2015
FORMAL LANGUAGE AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1	a)	What is Finite State Machine? What are the elements of FSM?	(3)
	b)	What is the difference between CFG and CSG?	(3)
	c)	Consider a DFA M = (Q, $\sum$, δ, q_0, F), What is the minimum and maximum number of initial states in it?	(2)
	d)	Give the formal definition of Moore machine	(2)
	e)	What are the applications of CFG?	(3)
	f)	List out the components of turing machine	(3)
	g)	What is dead state? Give an example.	(3)
	h)	Give the formal definition of TM? Give the block diagram of TM	(3)

PART-B

2	a)	What is Computation? What are the different models of Computation? Explain	(5)
	b)	What are the different classes of automata? How they are classified? Explain in detail.	(5)
	c)	Give the formal definition of FSM? What are the examples of FSM?	(6)
3	a)	What are the different operations on strings? Explain with examples?	(3)
	b)	What are the different types of languages in automata theory? Clearly give the rules for each of these languages and the relationship among these languages	(6)
	c)	Consider a language L^*, where L={ab,cd} with $\sum$={a,b,c,d}. (i) write all words in L^* that have six or less letters/symbols (ii) What is the shortest string in $\sum^*$ that is not in the language L^*?	(7)
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4 a) Construct a DFA accepting the language L={w: |w| mod 8 ≠0}on ∑={a,b} (8)

b) Obtain a DFA to accept strings of *a's* and *b's* such that, each block of 5 consecutive symbols has at least two *a's*. (8)

5 a) What is Arden's Theorem. Explain (4)

b) Convert the following DFA to RE. (6)

	0	1
p	p	q
q	q	r
r	r	r

c) Check whether the following two DFA's are equal or not (6)

	0	1
q1	q1	q2
q2	q3	q1
q3	q2	q3

	0	1
q4	q4	q5
q5	q6	q4
q6	q7	q6
q7	q6	q4

6 a) What is Chomsky's hierarchy? Explain (5)

b) What is Unit production? What is the procedure to remove the unit productions in CFG. (4)

c) Convert the following grammar to CNF. (7)

$S \rightarrow bA \mid aB$

$A \rightarrow bAA \mid aS \mid a$

$B \rightarrow aBB \mid bSbb$

7 a) Design a total Turing machine to accept the language: L2 = {w Є {a, b, c}*| #a(w) ≤ #b(w) ≤ #c(w)} (Note: '#' means number) (12)

b) Explain about P and NP classes of languages. (4)

Code No: RT22055 **R13** SET - 2

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2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1	a)	What is Finite State Machine? What are the advantages of FSM	(4)
	b)	Define regular expression	(2)
	c)	Consider a NFA M=(Q,∑, δ, q_0, F), What is the minimum and maximum number of states in it?	(3)
	d)	Give the formal definition of Mealy machine. Give an example	(3)
	e)	What is ambiguous grammar? Give an example	(3)
	f)	What is trap state? Give an example	(3)
	g)	Differentiate between PDA and TM with respect to tape and head	(4)

PART-B

2	a)	What is state diagram and state transition table. Explain with an example.	(5)
	b)	What are the different classes of automata? How they are classified? Explain in detail.	(5)
	c)	What are the components of FSM? Explain.	(6)
3	a)	What is push down Automata? Show how context free language is accepted by push down automata.	(8)
	b)	Consider a language L^*, where L={ab, cd} with ∑={a,b,c,d}. (i) Write all words in L^* that have six or less letters/symbols (ii) What is the shortest string in $\sum^*$ that is not in the language L^*?	(8)
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4 a) Construct a DFA accepting the language: {WЄ{a,b}*: W has both ab and ba as substrings} (8)

b) Design a ε-NFA for the regular expression a*bc/ab*/c* (6)

c) Define ε-closure of a state? Give an example (2)

5 a) What are the properties of Regular sets? Explain (4)

b) Convert the following DFA to RE. (6)

	0	1
p	p	q
q	q	r
r	p	r

c) Check the following two DFA are equal or not (6)

	0	1
q1	q1	q2
q2	q3	q1
q3	q2	q3

	0	1
q4	q4	q4
q5	q6	q4
q6	q4	q6
q7	q6	q4

6 a) What is use of simplification of CFG? What is the procedure to simplify the CFG? Explain (8)

b) Simplify the following grammar. (8)

$S \rightarrow aAa$

$A \rightarrow bBB / D$

$B \rightarrow ab / \varepsilon$

$C \rightarrow aB$

7 a) Give the formal definition of TM? What are the components of TM? What is *id* of TM? (6)

b) Design a Turing Machine for the {L=ww^R/wЄ$(0+1)^*$} (10)

Code No: RT22055 **R13** SET - 3

II B. Tech II Semester Regular Examinations, May/June - 2015
FORMAL LANGUAGE AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1	a)	What is Finite State Machine? What are the disadvantages of FSM	(3)
	b)	Φ*=-------- and ε*=-------	(2)
	c)	Consider a ε-NFA M=(Q,∑, δ, q_0, F), What is the minimum and maximum number of states in it?	(2)
	d)	What is Unit Production? If you eliminate the unit productions from the given CFG, what will be the effect on the language by the resultant grammar	(3)
	e)	When you convert Є-NFA to NFA, how do you decide the final states of resultant NFA. Give an example	(4)
	f)	What is left recursion? How to eliminate the left recursion	(4)
	e)	Differentiate between PDA and TM with respect to: halt state and final state	(4)

PART-B

2	a)	Give the formal definition of FSM? What are the examples of FSM?	(5)
	b)	Write short note on classification of Automata	(5)
	c)	What is state diagram and state transition table? Explain with an example.	(6)
3	a)	Differentiate NFA with DFA	(3)
	b)	Describe on detail about recursive enumerable language	(6)
	c)	Write regular expression for the language over {0,1}: the set of all strings that contain 1011.	(7)
4	a)	What are the advantages of NFA	(4)
	b)	Design a ε-NFA for the regular expression a*/b*/c*	(6)
	c)	Construct a DFA accepting the language: {WЄ{a,b}*: W has neither aa nor bb as a substring}	(6)
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5 a) Write short note on i) optimum DFA ii) Two wag DFA. (4)

b) Convert the following DFA to RE. (6)

	0	1
p	p	r
q	q	r
r	q	r

c) Check the following two DFA are equal or not (6)

	0	1
q1	q1	q2
q2	q3	q1
q3	Q3	q3

	0	1
q4	q6	q5
q5	q6	q4
q6	q7	q5
q7	q6	q4

6 a) Define Chomsky Normal form and Greibach Normal form? What is the difference between these two normal forms. (8)

b) Convert the following CFG into GNF. (8)

$A_1 \rightarrow A_2 A_3$

$A_2 \rightarrow A_3 A_1 / b$

$A_3 \rightarrow A_1 A_2 / a$

7 a) Give the formal definition of TM? What are the different types of TMs? Explain. (6)

b) Design a Turing Machine for L = {wcw^R/wϵ(0+1)*} (10)

Code No: RT22055 **R13** SET - 4

II B. Tech II Semester Regular Examinations, May/June - 2015
FORMAL LANGUAGE AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART-A

1	a)	What is Finite State Machine? What are the applications of FSM	(3)
	b)	If L={ ε , 00,01,10,11, 000,….111,…}, find $\bar{L}$ over the alphabet {0,1}	(3)
	c)	Consider a DFA M=(Q,∑, δ, q_0, F), What is the minimum and maximum number of final states in it?	(2)
	d)	What is useless symbol in a CFG? If you eliminate the useless symbols and productions from the given CFG, what will be the effect on the language by the resultant grammar	(3)
	e)	What is left recursion? How to eliminate the left recursion	(3)
	f)	Give the formal definition of Moore machine?	(2)
	g)	What is an infinite loop in TM? Explain with an example.	(3)
	h)	Give the differences between DFA and 2DFA with examples.	(3)

PART-B

2	a)	Give the general procedure for drawing a state diagram from transition table.	(5)
	b)	Construct a finite automata with transition for the regular expression r = 01^*+10	(5)
	c)	Define cellular and geographic automata.	(2)
	d)	What are the components of FSM? Explain	(4)
3	a)	Write a short note on i) Symbols ii) Alphabets and ii) Strings.	(3)
	b)	Write a short note on PDA with an example.	(6)
	c)	Write regular expression for the language over {0,1}: the set of all strings that contain 100.	(7)
4	a)	Define ε-closure of a state? Give an example	(3)
	b)	Design a DFA to accept odd number of *a's* and even number of *b's*, where ∑={a,b}. Show the acceptance of a string with an example	(7)
	c)	Design a ε-NFA for the regular expression a*b/cb*/ac*b	(6)
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5 a) List out the properties of Regular sets and Regular languages (4)

b) Minimize the following DFA, where state '0' is the start state and 3,5,6&7 are the final states. (6)

	a	b
0	1	2
1	4	5
2	3	-
3	-	-
4	4	2
5	6	-
6	7	-
7	7	-

c) Check the following two DFA are equal or not (6)

	0	1
q1	q1	q2
q2	q3	q1
q3	q2	q3

	0	1
q4	q4	q5
q5	q5	q4
q6	q7	q6
q7	q6	q4

6 a) What is normalization of CFG? What is the use of Normalization? What are the different normal forms? Explain (8)

b) Convert the following CFG into GNF. $S \rightarrow AA|0$, $A \rightarrow SS|1$ (8)

7 a) Design Turing machine to compute the function n! (Factorial of a number) (12)

b) Explain about undecidable problem (4)