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

II B. Tech II Semester Regular Examinations, April/May - 2016
FORMAL LANGUAGES 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) Construct a finite automata that accepts {0,1}+. (4M)
   b) List out the properties of recursive and recursively enumerable language. (4M)
   c) Differences between DFA and NFA with examples. (4M)
   d) What is a regular set? Give examples for it. (3M)
   e) How to remove Ambiguity from grammars? Explain with an example. (4M)
   f) Define universal Turing machine and universal language. (3M)

PART -B

2. a) Construct a finite state automata that accepts the language $\{a^ib^jc^k/i,j,k>0\}$. (8M)
   b) What is a Finite state machine? Give the mathematical representation of FSM. Explain each component. (8M)

3. a) Show that the language $L= \{a^nb^nc^n: n\geq 0\}$ is not context free. (8M)
   b) Briefly explain about various operations on Strings with suitable examples. (8M)

4. Define the DFA and regular expression. DFA accepts all strings corresponding to the expression 1*01(0+11)*. Also explain how to convert DFA to regular expression by eliminating states. (16M)

5. a) Convert the following regular expression into NFA with ∈ transition. (8M)
   i) 1*0+1101 ii) (0+1)*
   b) Give the properties of regular expressions and state and prove Arden's theorem. (8M)

6. Remove all ∈ and unit production rules from the following CFG (16M)
   S → AaA/ CA/ BaB
   A → aaBa/ CDA / aa / DC
   B → bB / bAB / bb/ aS
   C → Ca / bc / D
   D → bD / A

7. a) Design a Turing machine that accepts the language $L =\{ WW^R / W\in (0+1)^*$ and W^R is reverse of W} (10M)
   b) What is post correspondence problem? Explain with an example. (6M)

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

II B. Tech II Semester Regular Examinations, April/May - 2016
FORMAL LANGUAGES AND AUTOMATA THEORY
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Time: 3 hours Max. Marks: 70

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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)	Construct a finite automaton that accepts $\{0,1\}^*$	(4M)
	b)	Write any one application of CFG with example.	(4M)
	c)	What are the differences between DFA and NFA?	(4M)
	d)	Obtain the regular expression to accept strings of a's , b's and c's such that fourth symbol from the right is a and ends with b.	(4M)
	e)	Differentiate Chomskey and Gueibach normal forms	(3M)
	f)	Role of Checking of symbols in a Turing machine.	(3M)

PART -B

2.	a)	Construct a finite state automata that accepts those strings over {a,b} that contain aaa as substring.	(8M)
	b)	What is an Automaton? Give its classification. Give the applications of automata in real world.	(8M)
3.	a)	Write detail note on recursive enumerable languages with an example.	(6M)
	b)	Compare and contrast between regular grammar and unrestricted grammar with example.	(10M)
4.	a)	Convert the regular expression (ab+aba)* to a NFA.	(8M)
	b)	Construct a Non Deterministic Finite automaton (NDFA) with $\in$-moves for the regular expression (10+11)*00.	(8M)
5.	a)	Briefly explain how to convert regular expression into Automata with an example.	(8M)
	b)	Mention the differences between DFA, NFA and e-NFA.	(8M)
6.	a)	Construct a Greibach Normal Form grammar equivalent to the following CFG S → AA / 0 A → SS / 1	(8M)
	b)	Prove that the following grammar of arithmetic expression is ambiguous. E → E+E / E*E / (E) / (id)	(8M)
7.	a)	Draw a transition diagram for Turing machine and explain it in detail.	(6M)
	b)	Design a Turing machine to accept the set of al palindrome over {0,1}*. Draw a transition diagram for the Turing machine of the above.	(10M)

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

II B. Tech II Semester Regular Examinations, April/May - 2016
FORMAL LANGUAGES AND AUTOMATA THEORY
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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) Components of finite state automata. (4M)
   b) Give three examples of context sensitive grammar which are not context-free. (3M)
   c) Advantages and disadvantages of NDFA. (4M)
   d) What is Two-way DFA? Give its advantages of DFA. (4M)
   e) Show that the language L={ $a^n b^n$/ $n \geq 1$} is unambiguous. (4M)
   f) When do you say that a Turing machine accepts a string? (3M)

PART -B

2. a) Construct a finite state automata that recognizes all possible strings over the alphabet {0,1} ending with two consecutive zeros. (8M)
   b) Construct a finite state automata with $\in$-transition for the regular expression r=01*+10 (8M)

3. a) Show that the union of two recursive languages is recursive and the union of two recursive enumerable languages is also recursively enumerable. (8M)
   b) Explain the properties of recursive and recursively enumerable language in detail with an example. (8M)

4. a) Construct a DFA to accept the language L={w/w has both an even number of 0's and even number of 1's}. (8M)
   b) Explain the steps in the design of NFA with $\in$ - moves from NFA. (8M)

5. a) Construct a finite state automata equivalent to the regular expression (0+1)*(00+11)(0+1)* (8M)
   b) Explain the algorithm for optimization of DFA with suitable example. (8M)

6. a) Consider the CFG with the following production rules: (8M)
   S → aB/ bA
   A → bAA / aS/ a
   B → aBB / bS/ b
   Give the right most derivation and draw derivation tree for the string *abbaab*
   b) Find a Greibach normal form grammar equivalent to the following CFG. (8M)
   S → ASB/ AB
   A → a
   B → b

7. Design a Turing Machine which can multiply two positive integers. (16M)

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

II B. Tech II Semester Regular Examinations, April/May - 2016
FORMAL LANGUAGES AND AUTOMATA THEORY
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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) Draw a diagram for finite automata which represents a bank. (4M)
   b) What are context sensitive languages? Write one example. (3M)
   c) Draw a NFA which accepting the set of all strings whose second last symbol is 1. (4M)
   d) List the four components used to form a context free grammar. (4M)
   e) Chomsky normal form Vs Griebach normal form. (4M)
   f) Give examples of an undecidable problem. (3M)

PART –B

2. a) .Define the following terms, with an example for each: (8M)
      i) String ii) Alphabet iii) Powerset iv) Language
   b) Construct a finite state automata with $\in$-transition for the regular expression (ab+aba)* (8M)

3. a) Show that any non trivial property of the recursively enumerable language is undecidable. (8M)
   b) Define pumping lemma. How it is used in context free languages? (8M)

4. a) For the regular expression given below, obtain an NFA without $\in$-moves. (8M)
      (0+1)*(00+11)
   b) Discuss about equivalence of NFA and DFA. (8M)

5. a) Prove that regular sets are closed under union and complementation. (8M)
   b) Construct an NFA equivalent to the regular expression 10+(0+11)0*1 (8M)

6. a) Design a Moore machine that accepts all strings of 0's and 1's treated as binary integer number return a remainder 1 when divided by 3. (8M)
   b) Convert the following grammar into Chomsky Normal Form. (8M)
      S → aB/ bA
      A → bAA / aS/ a
      B → aBB / bS/ b

7. Design A Turing Machine to recognize the language $\{1^n2^n3^n/n\geq1\}$. (16M)

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