SRM UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE
QUESTIONS WITH ANSWERS

SUBJECT NAME : THEORY OF COMPUTATION
SUBJECT CODE : 15CS301
SEMESTER : 5

TOC MCQ's

Unit 1- Finite Automata

1. There are _____ tuples in finite state machine.
a) 4
b) 5
c) 6
d) unlimited
Answer:b
Explanation: states,input symbols,initial state,accepting state and transition function.

2. Transition function maps.
a) Σ * Q -> Σ
b) Q * Q -> Σ
c) Σ * Σ -> Q
d) Q * Σ -> Q
Answer:d
Explanation: Inputs are state and input string output is states.

3. Number of states require to accept string ends with 10.
a) 3
b) 2
c) 1
d) can't be represented.
Answer:a
Explanation: This is minimal finite automata.

4. Extended transition function is .
a) Q * Σ* -> Q
b) Q * Σ -> Q
c) Q* * Σ* -> Σ
d) Q * Σ -> Σ
Answer:a
Explanation: This takes single state and string of input to produce a state.

5. δ*(q,ya) is equivalent to .
a) δ((q,y),a)
b) δ(δ*(q,y),a)
c) δ(q,ya)
d) independent from δ notation
Answer:b
Explanation: First it parse y string after that it parse a.

6. String X is accepted by finite automata if .
a) δ*(q,x) E A
b) δ(q,x) E A
c) δ*(Q0,x) E A
d) δ(Q0,x) E A

Answer:c
Explanation: If automata starts with starting state and after finite moves if reaches to final step then it called accepted.

7. Languages of a automata is
a) If it is accepted by automata
b) If it halts
c) If automata touch final state in its life time
d) All language are language of automata
Answer:a
Explanation: If a string accepted by automata it is called language of automata.

8. Language of finite automata is.
a) Type 0
b) Type 1
c) Type 2
d) Type 3
Answer:d
Explanation: According to Chomsky classification.

9. Finite automata requires minimum _____ number of stacks.
a) 1
b) 0
c) 2
d) None of the mentioned
Answer:b
Explanation: Finite automata doesn't require any stack operation .

10. Number of final state require to accept Φ in minimal finite automata.
a) 1
b) 2
c) 3
d) None of the mentioned
Answer:d
Explanation: No final state requires.

11. Regular expression for all strings starts with ab and ends with bba is.
a) aba*b*bba
b) ab(ab)*bba
c) ab(a+b)*bba
d) All of the mentioned
Answer:c
Explanation: Starts with ab then any number of a or b and ends with bba.

12. How many DFA's exits with two states over input alphabet {0,1} ?
a) 16
b) 26
c) 32
d) 64
Answer:d
Explanation: Number of DFA's = 2^n * n^(2*n).

13. The basic limitation of finite automata is that
a) It can't remember arbitrary large amount of information.
b) It sometimes recognize grammar that are not regular.
c) It sometimes fails to recognize regular grammar.
d) All of the mentioned
Answer:a
Explanation:Because there is no memory associated with automata.

14. Number of states require to simulate a computer with memory capable of storing '3' words each of length '8'.
a) 3 * 2^8
b) 2^(3*8)

c) 2^(3+8)
d) None of the mentioned
Answer:b
Explanation: 2^(m*n) states requires .

15. FSM with output capability can be used to add two given integer in binary representation. This is
a) True
b) False
c) May be true
d) None of the mentioned
Answer:a
Explanation: Use them as a flip flop output .

16. A language is regular if and only if
a) accepted by DFA
b) accepted by PDA
c) accepted by LBA
d) accepted by Turing machine
Answer : a
Explanation : All of above machine can accept regular language but all string accepted by machine is regular only for DFA.

17. Regular grammar is
a) context free grammar
b) non context free grammar
c) english grammar
d) none of the mentioned
Answer : a
Explanation : Regular grammar is subset of context free grammar.

18. Let the class of language accepted by finite state machine be L1 and the class of languages represented by regular expressions be L2 then
a) L1<l2
b) L1>=L2
c) L1 U L2 = .*
d) L1=L2
Answer : d
Explanation : Finite state machine and regular expression have same power to express a language.

19. Regular expressions are closed under
a) Union
b) Intersection
c) Kleen star
d) All of the mentioned
Answer : d
Explanation : According to definition of regular expression.

20. The set of all strings over ∑ = {a,b} in which all strings of a's and b's ending in bb is
a) ab
b) a*bbb
c) (a+b)* bb
d) All of these

Answer: c)

UNIT 2- GRAMMERS

1. Push down automata accepts which language
a) Context sensitive language
b) Context free language
c) Recursive language

d) None of these
Answer: b)
2. A context free grammar G is in Chomsky normal form if every production is of the form
a) A → BC or A → A
b) A → BC or A → a
c) A → BCa or B → b
d) None of these
Answer: b)
3. Which of the following statement is false?
a) A recursive language is also a regular language
b) A context free language is also a regular language
c) A context free language is also recursive enumerable language
d) Both (a) and (b)
Answer: b)
4. A context free language is called ambiguous if
a) It has two or more leftmost derivations for some terminal string ω ϵ L (G)
b) It has two or more leftmost derivations for some terminal string ω ϵ L (G)
c) Both (a) and (b)
d) None of these
Answer: c)
5. Which of the following statement is false?
a) The context free language can be converted into Chomsky normal form
b) The context free language can be converted into Greibach normal form
c) The context free language is accepted by pushdown automata
d) None of these
Answer: d)
6. The language L={$0^m1^m0^m$| m ≥ 1} is a
a) Regular language
b) Context free language
c) Both (a) and (b)
d) None of these
Answer: d)
7. While converting the context free grammar into Greibach normal form, which of the following is not necessary
a) Elimination of null production
b) Elimination of unit production
c) Converting given grammar in Chomsky normal form
d) None of these
Answer: d)
8. The context free grammar S → A111|S1, A → A0 | 00 is equivalent to
a) {0^n1^m | n=2, m=3}
b) {0^n1^m | n=1, m=5}
c) {0^n1^m | n should be greater than two and m should be greater than four}
d) None of these
Answer: a)
9. The context free grammar S → SS | 0S1 | 1S0 | ε generates
a) Equal number of 0's and 1's
b) Unequal number of 0's and 1's
c) Any number of 0's followed by any number of 1's
d) None of these
Answer: a)
10. Which of the following statement is false?
a) In derivation tree, the label of each leaf node is terminal
b) In derivation tree, the label of all nodes except leaf nodes is a variable
c) In derivation tree, if the root of a sub tree is X then it is called –tree
d) None of these
Answer: d)
11. Push down automata accepts which language
a) Context sensitive language
b) Context free language
c) Recursive language
d) None of these

Answer: b)

12. A context free grammar G is in Chomsky normal form if every production is of the form
a) A → BC or A → A
b) A → BC or A → a
c) A → BCa or B → b
d) None of these
Answer: b)
13. Which of the following statement is false?
a) A recursive language is also a regular language
b) A context free language is also a regular language
c) A context free language is also recursive enumerable language
d) Both (a) and (b)
Answer: b)
14. A context free language is called ambiguous if
a) It has two or more leftmost derivations for some terminal string ω ϵ L (G)
b) It has two or more leftmost derivations for some terminal string ω ϵ L (G)
c) Both (a) and (b)
d) None of these
Answer: c)
15. Which of the following statement is false?
a) The context free language can be converted into Chomsky normal form
b) The context free language can be converted into Greibach normal form
c) The context free language is accepted by pushdown automata
d) None of these
Answer: d)
16. The language L={$0^m1^m0^m$| m ≥ 1} is a
a) Regular language
b) Context free language
c) Both (a) and (b)
d) None of these
Answer: d)
17. While converting the context free grammar into Greibach normal form, which of the following is not necessary
a) Elimination of null production
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c) Converting given grammar in Chomsky normal form
d) None of these
Answer: d)
18. The context free grammar S → A111|S1, A → A0 | 00 is equivalent to
a) {0^n1^m | n=2, m=3}
b) {0^n1^m | n=1, m=5}
c) {0^n1^m | n should be greater than two and m should be greater than four}
d) None of these
Answer: a)

19. The context free grammar S → SS | 0S1 | 1S0 | ε generates
a) Equal number of 0's and 1's
b) Unequal number of 0's and 1's
c) Any number of 0's followed by any number of 1's
d) None of these
Answer: a)
20. Which of the following statement is false?
a) In derivation tree, the label of each leaf node is terminal
b) In derivation tree, the label of all nodes except leaf nodes is a variable
c) In derivation tree, if the root of a sub tree is X then it is called –tree
d) None of these
Answer: d)

1.
The following grammar
G = (N, T, P, S)

N = {S, A, B}
T = {a, b, c}
P : S → aSa
S → aAa
A → bB
B → bB
B → c is
a. is type 3
b. is type 2 but not type 3
c. is type 1 but not type 2
d. is type 0 but not type 1
2.
The following grammar
G = (N, T, P, S)
N = {S, A, B, C, D, E}
T = {a, b, c}
P : S → aAB
AB → CD
CD → CE
C → aC
C → b
bE → bc is

a. is type 3
b. is type 2 but not type 3
c. is type 1 but not type 2
d. is type 0 but not type 1
3.
The following grammar
G = (N, T, P, S)
N = {S, A, B, C}
T = {a, b, c}
P : S → aS
A → bB
B → cC
C → a is
a. is type 3
b. is type 2 but not type 3
c. is type 1 but not type 2
d. is type 0 but not type 1
4.
The following grammar
G = (N, T, P, S)
N = {S, A, B, C, D, E}
T = (a, b, c}
P : S → ABCD
BCD → DE
D → aD
D → a
E → bE
E → c is

a. is type 3
b. is type 2 but not type 3
c. is type 1 but not type 2
d. is type 0 but not type 1
5.
Consider the following CFG
S → aB S → bA
B → b A → a
B → bS A → aS

B → aBB A → bAA

Consider the following derivation
S ⇒ aB
⇒ aaBB
⇒ aaBb
⇒ aabSb
⇒ aabbAb
⇒ aabbab

This derivation is
a. a leftmost derivation
b. a rightmost derivation
c. both leftmost and rightmost derivation
d. neither leftmost nor rightmost derivation
6.
Consider the following language
L = {anbncndn|n ≥ 1}
L is
a. CFL but not regular
b. CSL but not CFL
c. regular
d. type 0 language but not type 1
7.
Consider the following language
L = {anbn|n ≥ 1}
L is
a. CFL but not regular
b. CSL but not CFL
c. regular
d. type 0 language but not type 1
8.
Consider the following language
L = {anbmcpdq|n, m, p, q ≥ 1}
L is
a. CFL but not regular
b. CSL but not CFL
c. regular
d. type 0 language but not type 1
9.
The following CFG is in
S → AB
B → CD
B → AD
B → b
D → AD
D → d
A → a
C → a
a. Chomsky normal form but not strong Chomsky normal form
b. Weak Chomsky normal form but not Chomsky normal form
c. Strong Chomsky normal form
d. Greibach normal form
10.
The following CFG is in
S → aBB
B → bAA
A → a
B → b
a. Chomsky normal form but not strong Chomsky normal form
b. Weak Chomsky normal form but not Chomsky normal form

c. Strong Chomsky normal form
d. Greibach normal form
11.
Which of the following CF language is inherently ambiguous?
a. {anbncmdm|n, m ≥ 1}
b. {anbmcpdq|n = p or m = q, n, m, p, q ≥ 1}
c. {anbmcpdq|n ≠ m ∧ p ≠ q}
d. {anbmcpdq|n ≠ m ∨ p ≠ q}

14.
Can a DFSA simulate a NFSA
a. No
b. Yes
c. sometimes
d. depends on NFA

16.
The concept of FSA is much used in this part of the compiler
a. lexical analysis
b. parser
c. code generation
d. code optimization
17.
The concept of grammar is much used in this part of the compiler
a. lexical analysis
b. parser
c. code generation
d. code optimization
18.
(a + b)(cd)*(a + b) denotes the following set
a. {a(cd)nb|n ≥ 1}
b. {a(cd)na|n ≥ 1} ∪ {b(cd)nb/n ≥ 1}
c. {a(cd)na|n ≥ 0} ∪ {a(cd)nb/n ≥ 0} ∪ {b(cd)na/n ≥ 0} ∪ {b(cd)nb/n ≥ 0}
d. {acndnb|n ≥ 1}
19.
baa*c denotes the set
a. {bnamcp|n, m, p ≥ 1}
b. {banc|n ≥ 0}
c. {banc|n ≥ 1}
d. {w|w is a string of a, b, c}
20.
The set of all strings over the alphabet Σ = {a, b} (including ε) is denoted by
a. (a + b)*
b. (a + b)+
c. a+b+
d. a*b*
21.
Palindromes can’t be recognized by any FSA because
a. FSA cannot remember arbitrarily large amount of information
b. FSA cannot deterministically fix the midpoint
c. Even if the mid point is known an FSA cannot find whether the second half of the string matches the first half
d. all of the above
22.
Let Σ = {a, b, c, d, e}. The number of strings in Σ* of length 4 such that no symbol is used more than once in a string is
a. 360
b. 120
c. 35d. 36
23.
Which of the following denotes Chomskian hiearchy?
a. REG ⊂ CFL ⊂ CSL ⊂ type0
b. CFL ⊂ REG ⊂ type0 ⊂ CSL

c. CSL ⊂ type0 ⊂ REG ⊂ CFL
d. CSL ⊂ CFL ⊂ REG ⊂ type0
24.
A language L is accepted by a FSA iff it is
a. CFL
b. CSL
c. recursive
d. regular
25.
Which of the following regular expressions denotes a language comprising of all possible strings over Σ = {a, b} of length n where n is a multiple of 3.
a. (a + b + aa + bb + aba + bba)*
b. (aaa + bbb)*
c. ((a + b)(a + b)(a + b))*
d. (aaa + ab + a) + (bbb + bb + a)
26.
A language is represented by a regular expression (a)*(a + ba). Which of the following string does not belong to the regular set represented by the above expression.
a. aaa
b. aba
c. ababad. aa
27.
Which of the following is not primitive recursive but partially recursive?
a. McCarthy's function
b. Riemann function
c. Ackermann's function
d. Bounded function
28.
Consider the following right-linear grammar G = (N, T, P, S) N = {S}
P : S → aS|aA T = {a, b}
A → bA|b

Which of the following regular expression denotes L(G)?
a. (a + b)*
b. a(ab)*b
c. aa*bb*
d. a*b*
29.
Which of the following strings is not generated by the following grammar? S → SaSbS|ε
a. aabb
b. abab
c. aababb
d. aaabb

31.
Consider a language L for which there exists a Turing machine ™, T, that accepts every word in L and either rejects or loops for every word that is not in L. The language L is
a. NP hard
b. NP complete
c. recursive
d. recursively enumerable
32.
Consider the following statements
I. Recursive languages are closed under complementation
II. Recursively enumerable languages are closed under union
III. Recursively enumerable languages are closed under complementation
Which of the above statement are TRUE?
a. I only
b. I and II
c. I and III
d. II and III

33.
Which of the following statement is wrong?
a. Any regular language can be generated by a context-free grammar
b. Some non-regular languages cannot be generated by any CFG
c. the intersection of a CFL and regular set is a CFL
d. All non-regular languages can be generated by CFGs.
34.
Recursively enumerable languages are not closed under
a. union
b. homomorphism
c. complementation
d. concatenation
35.
Which of the following problem is undecidable?
a. membership problem for CFL
b. membership problem for regular sets
c. membership problem for CSL
d. membership problem for type 0 languages
36.
Recursive languages are
a. a proper superset of CFL
b. always recognized by PDA
c. are also called type 0 languages
d. always recognized by FSA
37.
R1 and R2 are regular sets. Which of the following is not true?
a. R1 ∩ R2 neet not be regular
b. Σ* − R1 is regular
c. R1 ∪ R2 is regular
d. is regular

38.
Which of the following regular expression identity is true?
a. r(*) = r*
b. (r*s*)* = (r + s)*
c. (r + s)* = r* + s*
d. r*s* = r* + s*
39.
Which one of the following statement is FALSE?
a. context-free languages are closed under union
b. context-free languages are closed under concatenation
c. context-free languages are closed under intersection
d. context-free languages are closed under Kleene closure
40.
Which of the following conversion is not possible (algorithmically)?
a. regular grammar to context-free grammar
b. nondeterministic FSA to deterministic FSA
c. nondeterministic PDA to deterministic PDA
d. nondeterministic TM to deterministic TM
Answers
1.b2.c3.a4.d5.d6.b7.a8.c9.c10.d11.b12.a13.b14.b15.b16.a17.b18.c19.c20.a21.d22.b23.a24.d25.c26.c27.c28.c29.d30.c31.d32.b33.d34.c35.d36.a37.a38.b39.c40.c

UNIT 3 PUSH DOWN AUTOMATA

1. PDA is more powerful than
a) Turing machine

b) Finite automata
c) Both (a) and (b)
d) None of these
Answer: b)
2. Which operation can be applied on stack?
a) PUSH
b) POP
c) Both (a) and (b)
d) None of these
Answer: c)
3. PDA can be represented with the help of
a) Instantaneous description
b) Transition diagram
c) Transition table
d) All of these
Answer: d)
4. Which of the following statement is false?
a) Let L is a language accepted by a PDA P then there exist a CFG G L such that L(G) =N(P)
b) If L is a CFL then there exists a push down automata P accepting CFL L by empty stack i.e. L = N(P)
c) If L is a language accepted by PDA A by final state there exist a PDA B that accepts L by empty stack such that L =L(A) = N(B)
d) All of these
Answer: d)
5. A push down automata is different than finite automata by
a) Its memory (stack)
b) Number of states
c) Both (a) and (b)
d) None of these
Answer: a)
6. The push down automata indicate the acceptance of input string in terms of
a) Finial state
b) Empty store
c) Both (a) and (b)
d) None of these
Answer: c)
7. Which type of symbols contain in the stack of PDA
a) Variable
b) Terminal
c) Both (a) and (b)
d) None of these
Answer: c)
8. The instantaneous description is PDA shows
a) Present state
b) Stack symbol
c) String to be processed
d) All of these
Answer: d)
9. The symbol Z0 in formal definition of PDA is used for
a) Stack symbol
b) Input symbol
c) Both (a) and (b)
d) None of these
Answer: a)
10. A PDA chooses the next move based on
a) Current state
b) Next input symbol
c) Both (a) and (b)
d) None of these
Answer: c)
11. The language accepted by a Pushdown Automation in which the stack is limited to 10 items is best described as
(A) Context Free

(B) Regular
(C) Deterministic Context Free
(D) Recursive
Answer: (B)

UNIT IV - TURING MACHINE

1. Let R1 and R2 be regular sets defined over alphabet ∑ then
a) R1 ∪ R2 is regular
b) R1 ∩ R2 is regular
c) ∑ ∩ R2 is not regular
d) R*2 is not regular
Answer**: a)**
2. Consider the production of the grammar
S → AA
A → aa
A → bb
Describe the language specified by the production grammar.
a) L = {aaaa, aabb, bbaa, bbbb}
b) L = {abab, abaa, aaab, baaa}
c) L = {aaab, baba, bbaa, bbbb}
d) L = {aaaa, abab, bbaa, aaab}
Answer: a)
3. Given a production grammar that specified language
$L = \{a^i b^{2^j} / i \geq 1\}$
a) {S → aSbb, S → abb}
b) {S → aSb, S → b}
c) {S → aA, S → b, A → b}
d) None of these
Answer: a)
4. Which of the following string can be obtained by language
$L = \{a^i b^{2^j} / i \geq 1\}$
a) aaabbbbbb
b) aabbb
c) abbabbba
d) aaaabbbabb
Answer: a)

5. Given a production grammar for the language L = {x/x ∈ (a, b)* , the number of a's in x is a multiple of 3}
a) {S → bS, S → b, S → aA, S → bA, A → aB, B → bB, B → aS, S → a}
b) {S → aS, S → bA, A → bB, B → bBa, B → bB}
c) {S → aaS, S → bbA, A → bB, B → ba}
d) None of these
Answer: a)
6. Let L1 = {$a^i b^j$ / i, j ≥ 1, i≠ j} and L2 = {$a^i b^j$ / i < j}, the union of L1 and L2 is given by
a) {$a^i b^j$ / i > j ≥ 1}
b) {$a^i b^j$ / i, j ≥ 1}
c) {$a^i b^j$ / i > j ≥ 1}
d) {$a^i b^j$ / i, j ≥ 1, i≠ j}
Answer: d)
7. Given a production grammar for the language
L = {$a^i b^j$ / i, j ≥ 1, i≠ j}
a) {S → aS, S → aB, B → ab, A → aaB, B → b}
b) {S → A, S → C, A → aA, A → aB, B → aBb, B → ab, C → Cb, C → Bb}
c) {S → A, A → aA, A → aB, B → ab}
d) None of these
Answer: b)
8. The production grammar is (S → aSbb, S → abb) is
a) Type-3 grammar
b) Type -2 grammar
c) Type -1 grammar

d) Type -0 grammar
Answer: b)

9. Which of the following statement is wrong?
a) A turing machine cannot solve halting problem
b) Set of recursively enumerable language is closed under union
c) A finite state machine with 3 stacks is more powerful than finite state machine with 2 stacks
d) Context sensitive grammar can be recognized by a linearly bounded memory machine
Answer: c)

10. Which of the following statement is wrong?
a) Recursive languages are closed under union
b) Recursive languages are closed under complementation
c) If a language and its complement are both regular, then the language must be recursive
d) A language is accepted by FA if and only if it is recursive
Answer: d)

11. Which of the following statement is wrong?
a) Every recursive language is recursively enumerable
b) A language is accepted by FA if and only if it is context free
c) Recursive languages are closed under intersection
d) A language is accepted by FA if and only if it is right linear
Answer**: b)**

12. Which of the following statement is true?
a) All languages can be generated by CFG
b) The number of symbols necessary to simulate a turing machine (TM) with m symbols and n states is mn
c) Any regular language has an equivalent CFG
d) The class of CFG is not closed under union
Answer: c)

13. Recursively enumerable languages are not closed under
a) Complementation
b) Union
c) Intersection
d) none of these
Answer: a)

14. Regular expression (x/y) (x/y) denotes the set
a) {x/y, x/y}
b) {xx, xy, yx, yy}
c) {x, y}
d) {x, y,xy}
Answer: b)

15. Regular expression x/y denoted the set
a) {x,y}
b) {xy}
c) {x}
d) {y}
Answer: a)

16. The regular expressions denote a language comprising all possible strings of even length over thealphabet (0, 1)
a) 1 + 0 (1 + 0)*
b) (0 + 1) (1 + 0)*
c) (1 + 0)
d) (00 + 0111 + 10)*
Answer: d)

17. The regular expressions denote zero or more instances of an x or y is

a) (x + y)
b) (x + y)*
c) (x* + y)
d) (xy)*
Answer: b)

18. The regular expression have all strings in which any number of 0's is followed by any number of 1's followed by any number of 2's is
a) (0 + 1 + 2)*
b) 0*1*2*
c) 0* + 1 + 2
d) (0 + 1)*2*
Answer: b)

19. The regular expression have all strings of 0's and 1's with no two consecutive 0's, is
a) (0 + 1)
b) (0 + 1)*
c) (0 + ∈) (1 + 10)*
d) (0 + 1)* 011
Answer: c)

20. The regular expression with all strings of 0's and 1's with at-least two consecutive 0's, is
a) 1 + (10)*
b) (0 + 1)*00 (0 + 1)*
c) (0 + 1)*011
d) 0*1*2*
Answer: b)

PART -B
UNIT- I

1) Is it true that the language accepted by any NDFA is different from the regular language? Justify your answer.
2) Describe the following sets by regular expression:
(a) L1=the set of all strings of 0's and 1's ending in 00.
(b)L2=the set of all strings of 0's and 1's beginning with '0'
and ending with '1'.
3)Describe Transition system.
4)Define Deterministic automata with example.
5)Define Non-Deterministic automata with example.
6)Define NDFA with e-transition .Give example.
7)Define e-closure with example.
8)What is the difference between DFA and NDFA.
9)Define acceptance of a string and language.
10)Give the regular set or language for the regular expression:
(a)1(01)*(10)*1
(b)(1+10)*001.
11)Define regular expression with example.

12)Construct DFA for the set of strings{ } ending with '00'.
13)Obtain the DFA equivalent to the following NDFA.
F={q2},initial state={q0}
States\inputs 0 1
q0 {q0,q1} {q0}
q1 - {q2}
q2 - -

14)Obtain an NDFA without e-transition to the following NDFA with E-transition:
F={q2},initial state={q0}

States\inputs	0	1	2	e
q0	{q0}	-	-	{q1}
q1	-	{q1}	-	{q2}
q2	-	-	{q2}	-

15)Define Moore Machine with example.
16)Define Mealy machine with example.
17)Prove that for every Moore machine M1 there is a Mealy machine M2.
18)State the pumping lemma for regular sets or regular language.
19)What is the use of the pumping lemma for regular sets?
20)State the application of the pumping lemma for regular sets.

UNIT-II

1)Define a grammar with example.
2)Define CFG with example.
3)State the different types of grammar.
4)Find L(G) where G=({S},{0,1},{S->0S1,S->E},S)
5)Define derivation tree for a CFG.
6)Let G=({S,C},{a,b},P,S) where P consists of S->aCa, C->aCa/b.Find L(G).
7)Consider G whose productions are S->aAS/a, A->SbA/SS/ba.Show that S=>aabbaa and construct a derivation tree whose yield is aabbaa.
8)Define Ambiquous grammar with example.
9)Define LMD and RMD.Give example.
10)Define sentinential form with example.
11)Define useless and useful symbols.Give example.
12)When a variable is said to be nullable?
13)Define Unit production with example and Useless production.
14)Define E-production.
15)What are the kinds of Normal forms.
16)Define CNF with example.
17)Define GNF with example.
18)State the difference between CNF and GNF.
19)Define inherently ambiquous CFL.
20)Define A-derivable.
21)When CFG is said to be linear grammar?
22)Define an operator grammar.

UNIT-III

1)Define Pushdown Automata.
2)Give an example of a PDA.
3)Define the acceptance of a PDA by empty stack.Is it true that a language accepted by a PDA by empty stack or by that of final states are different languages?
4)What are the different types of language acceptances by a PDA and define them?

5)Give an eample of a language accepted by a PDA but not by DPDA.
6)Describe the two types of moves of PDA.
7)Describe the instantaneous Description of a PDA.
8)When is a PDA said to be deterministic?Are the deterministic and non-deterministic models of PDA equivalent with respect to the language accepted?
9)State the pumping lemma for CFL.
10)What is the use of pumping lemma for CFL?(Applicatons.)

UNIT- IV

1)Define Turing machine.
2)Define ID and Move of a Turing machine.
3)Define the language accepted by a TM.
4)Is it possible that a TM could be considered as computer of functions from integers to integer?If yes,justify your answer.
5)Define total recursive and partial recursive functions.
6)When a language is said to be recursively enumerable?
7)When is the technique of checking of symbols useful?
8)Define Multiple Turing machine.
9)When is the technique of shifting over useful?
10)List some of the modified versions of of the basic model of a TM.
11)Define Multidimensional TM.
12)Define Multihead TM.
13)What is an off-line TM.
14)When is a function 'f' said to be "Turing computable"?
15)Construct a TM to compute the function f(x)=x+2.
16)Construct a TM that accepts strings over{1} containing even number of 1's.
17)Explain how a TM with multiple tracks of the tape can be used to determine the given number is prime or not?

UNIT V

1) When a problem is said to be decidable and give an example of an undecidable problem?
2) What is undecidability?
3) Explain the modified Part's Correspondance Problem(MPCP).
4) Differentiate recursive and recursively enumerable language.
5) Give the properties of recursively enumerable sets which are undecidable.
6)Show that the union of recursive languages is recursive.
7)Explain the Halting problem.Is it decicable or undecidable problem?
8)Define universal language Lu.
9)Obtain the code for,where
M=({q1,q2,q3},{0,1},{0,1,B},d,q1,B,{q2}) have moves;
10)Define the language Ld.

PART-C

UNIT -I

1) If L is a set accepted by an NDFA, then show that L is accepted by a DFA.
2) If L is a set accepted by an NDFA with e - transition ,then show that L is accepted by an NDFA without e- transition.
3) Let 'r; be a regular expression . Then ,show that there exists an NDFA with e- transitions that accepts L(r).

4) If L is accepted by a DFA, then show that L is denoted by a regular expression.
5) Construct an NDFA equivalent to (0+1)*(00+11).
6) Construct a regular expression corresponding to the transition diagram in the following figure.
F={q1},initial state={q1}
States\inputs 0 1
q1 q1 q2
q2 q3 q2
q3 q1 q2

7) If M1 is a meanly machine, then show that there is a Moore machine M2 equivalent to M1.
8) Constuct Moore machine from the given meanly machine.
Initial state={q0}

States\inputs 0 1 x y
q0 {p0}
{p1} {p0,p1} -
p0 {p0} {p1} {p1} {p0}
p1 {p0} {p1} {p0} {p1}

9) Show that the set L = { 0i 1i / i =1} is not regular
10)Show that the set L = { oi2 / i is an integer , i =1 } is not regular
11)Show that L={0m 1n 0 m+n}is not regular.
12)Construct minimized DFA from the given NDFA.
States\inputs 0 1
q0 {q0,q1} {q0,q3}
q1 {q2} -
q2 - -
q3 - {q4}
q4 - -
13)Construct an NDFA without € transitions from the given NDFA with e transition.
F={q2},initial state={q0}
States\inputs 0 1 2 e
q0 q0 - - q1
q1 - q1 - q2
q2 - - q2 -

UNIT-II

1) Let a be CFG and let A? w in a., then S.t that there is a LMD of 'w'.
2) Let G=(V,T,P,S)be a CFG. Then prove that s? a iff there is a destination tree in grammar G with yield a.
3) If G is the grammar s –>sbs/a,show that G is ambiguous.
4) Explain in detail the ambiguity in CFG.
5) Prove that every non empty CFL is generated by a CFG with no useless symbols.
6) Let G=(V,T,P,S) be a CFG with L=L(G).Then show that there exists a CFG G¹ with L(G¹)=L-{e}has no useless symbols or e-productions.
7) Prove that for any CFL without e is defined by a grammar with no useless symbols, €-productions or unit production.
8) Prove that for any CFL without e is generated by a grammar in which every production is of the form A–>BC OR A–>a(CNF).
9) Prove that for every CFL without 'e' can be generated by a grammar for which every production is of the form A–>aa , where 'A' is a variable ,'a' is a terminal &'a' is eternize of variables (possible empty)(GNF).

10)Find a grammar in CNF equivalent to S–>aAD;A–>ab/bAB;
B–>b;D–>d.
11)Find a grammar in CNF equivalent to S->aAbB;A–>aA/a;
B–>bB/b.
12)Construct a grammar in GNF equivalent to the grammar
S–>AA/a;A–>SS/b.
13)Convert to GNF the grammar G-C{A1,A2,A3},{a,b},{P,A1},where P consists of the following :
A1–>A2A3;A2–>A3A1/b;A3–>A1A2/a;

UNIT -III

1) If L is L(M2) for some PDA M2,then show that L is N(M1)has same PDA M1.
2) If L is N(M1) for some PDA M1 ,then show that L is L(M2)for some PDA M2.
3) If L is CFL, then prove that there exists a PDA M such that L=N(M).
4) If L is N(M) for some PDA M,then show that L is CFL.
5) Construct when CFG G which accepts N(M),when M=C{q0,q1},{0,1},{z0,z1},?,q,?)and '?'is given by:
? (q0, 0,z0)=(q0,zz0); ?(q1,1,Z)=(q1,e)
? (q0, 0,z)=(q0,ZZ); ?(q1, e,Z)=(q1, e)
? (q0,1,z)=(q1, e); ?(q1, e,z0)=(q1, e)
6) Construct a PDA for the language L={wwR/w in (0+1)*}
7) Construct a PDA for the language L={wcwR/w in (0+1)*}
8) Show that L={ aibjcidj/i=1, j=1}is not a CFL
9) Show that L={on1n 2 n/n=1}is not a CFL.
10)Show that L={ aibjck/i?j,j?k& i?k} is not a CFL.

Unit IV

1) Design a turing machine M to implement the function "multiplication"using the subroutine "copy".
2) Design a TM to compute proper subtraction m-n.
3) Design a TM to accept the language L={0n1 n/n=1}
4) Construct a TM to recognize the language L={ 02n/n=0}
5) Enumerate the various techniques adopted for the construction of a TM.
6) Explain finite control can be treated as storage for a finite amount of information.
7) Illustrate with an example the techniques of creating the tape to have multiple tracks.
8) Illustrate with example the techniques of checking off symbols.
9) Construct a part of TM to shift non blank symbol two cells to the right end. support that tape does not contain blanks between non blanks.
10) Prove that if L is recognized by a TM with a two way infinite tape iff it is recognized by a TM with a one way infinite tape

UNIT V

1)Discuss in detail about universal TM.
2)Show that the complement of a recursive language is recursive.
3)Show that Lu is recursively enumerable but not recursive.
4)Show that Ld is not recursively enumerable.
5)If a language L and its complement L' are both recursively enumerable, then show that L and hence L' are recursive.
6)Prove that there exists a recursively enumerable language whose complement is not recursively enumerable.
7)Prove that any non-trivial property of the recursively enumerable languages is undecidable.(Rice's theorem).
8)Prove that Halting problem is undecidable.