COURSE CODE: CSE322

Course Title: FORMAL LANGUAGES AND AUTOMATION THEORY

Time Allowed: 3 hrs Max. Marks: 60

Read the following instructions carefully before attempting the question paper.

1. Match the Paper Code shaded on the OMR Sheet with the Paper code mentioned on the question paper and ensure that both are the same.
2. This question paper contains 60 questions of 1 mark each. 0.25 marks will be deducted for each wrong answer.
3. All questions are compulsory.
4. Do not write or mark anything on the question paper except your registration no. on the designated space.
5. Submit the question paper and the rough sheet(s) along with the OMR sheet to the invigilator before leaving the examination hall.

Q. 1 Which of the following is false for an abstract machine?
a) Turing machine b) theoretical model of computer
c) assumes a discrete time paradigm d) all of the mentioned L6 CO4

Q. 2 Fill in the blank with the most appropriate option.
Statement: In theory of computation, abstract machines are often used in _____ regarding computability or to analyze the complexity of an algorithm.
a) thought experiments b) principle c) hypothesis d) all of the mentioned L6 CO4

Q. 3 The following move of a PDA is on the basis of:
a) Present state b) Input Symbol c) Present state and Input Symbol d) None of the mentioned L6 CO4

Q. 4 Halting states are of two types. They are:
a) Accept and Reject b) Reject and Allow c) Start and Reject d) None of the mentioned L6 CO4

Q. 5 If d is not defined on the current state and the current tape symbol, then the machine _____.
a) does not halts b) halts c) goes into loop forever d) none of the mentioned L6 CO4

Q. 6 Suppose A->xBz and B->y, then the simplified grammar would be:
a) A->xyz b) A->xBz|xyz c) A->xBz|B|y d) none of the mentioned L4 CO5

Q. 7 Given grammar G:
S->aS|A|C
A->a
B->aa
C->aCb
Find the set of variables that can produce strings only with the set of terminals.

a) {C} b) {A,B} c) {A,B,S} d) None of the mentioned L4 CO5

Q. 8 Given grammar:
S->aS|A
A->a
B->aa
Find the number of variables reachable from the Starting Variable?

a) 0 b) 1
c) 2 d) None of the mentioned L4 CO5

Q. 9 The most suitable data structure used to represent the derivations in compiler:
a) Queue b) Linked List
c) Tree d) Hash Tables L4 CO5

Q. 10 Let w= xyz and y refers to the middle portion and |y|>0. What do we call the process of repeating y 0 or more times before checking that they still belong to the language L or not?
a) Generating b) Pumping c) Producing d) None of the mentioned L4 CO5

Q. 11 Fill in the blank in terms of p, where p is the maximum string length in L.
Statement: Finite languages trivially satisfy the pumping lemma by having n = _____.
a) p*1 b) p+1 c) p-1 d) None of the mentioned L4 CO5

Q. 12 Let w be a string and fragmented by three variable x, y, and z as per pumping lemma. What does these variables represent?
a) string count
b) string
c) string count and string
d) none of the mentioned L4 CO5

Q. 13 For the expression E*(E) where * and brackets are the operation, number of nodes in the respective parse tree are:
a) 6
b) 7
c) 5
d) 2 L4 CO5

Q. 14 Which among the following is the root of the parse tree?
a) Production P b) Terminal T c) Variable V d) Starting Variable S L4 CO5

Q. 15 The decision problem is the function from string to _____.
a) char b) int
c) boolean d) none of the mentioned L2 CO6

Q. 16 Which among the following are undecidable theories?
a) The first order theory of boolean algebra
b) The first order theory of Euclidean geomentry
c) The first order theory of hyperbolic geometry
d) The first order theory of the natural number with addition, multiplication, and equality L2 CO6

Q. 17 A language L is said to be _____ if there is a turing machine M such that L(M)=L and M halts at every point.
a) Turing acceptable b) decidable
c) undecidable d) none of the mentioned L2 CO6

Q. 18 The language accepted by a turing machine is called _____.
a) Recursive Ennumerable b) Recursive
c) Recursive Ennumerable and Recursive d) None of the mentioned L2 CO6

Q. 19 Decidable can be taken as a synonym to:
a) recursive b) non recursive
c) recognizable d) none of the mentioned L2 CO6

Q. 20 The problems which have no algorithm, regardless of whether or not they are accepted by a turing machine that fails to halts on some input are referred as:
a) Decidable b) Undecidable c) Computable d) None of the mentioned L2 CO6

Q.21 There are_____ tuples in finite state machine.
a) 4 b) 5 c) 6 d) unlimited L2 CO1

Q.22 The complement of a language will only be defined when and only when the _____ over the language is defined.
a) String b) Word c) Alphabet d) Grammar L2 CO1

Q. 23 Which among the following is not notated as infinite language?
a) Palindrome b) Reverse c) Factorial d) L={ab}* L2 CO1

Q. 24 Let u='1101', v='0001', then uv=1101000l and vu= 0001110l.Using the given information what is the identity element for the string?
a) u^{-1} b) v^{-1} c) $u^{-1}v^{-1}$ d) ε L2 CO1

Q. 25 How many languages are over the alphabet R?
a) countably infinite b) countably finite c) uncountable finite d) uncountable infinite L2 CO1

Q. 26 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 L4 CO2

Q. 27 How many strings of length less than 4 contains the language described by the regular expression (x+y)*)(x+xb)*?
a) 7 b) 10 c) 12 d) 11 L4 CO2

Q.28 Which of the following is true?

d) All of the mentioned L4 CO2

Q. 29 Regular expression are
a) Type 0 language b) Type 1 language c) Type 2 language d) Type 3 language L4 CO2

Q. 30 Which of the following is true?
a) Every subset of a regular set is regular
b) Every finite subset of non-regular set is regular
c) The union of two non regular set is not regular
d) Infinite union of finite set is regular L4 CO2

Q. 31 The entity which generate Language is termed as:
a) Automata b) Tokens c) Grammar d) Data L4 CO5

Q. 32 Which of the following statement is false?
a) Context free language is the subset of context sensitive language
b) Regular language is the subset of context sensitive language
c) Recursively ennumerable language is the super set of regular language
d) Context sensitive language is a subset of context free language L4 CO5

Q. 33 Which among the following cannot be accepted by a regular grammar?
a) L is a set of numbers divisible by 2
b) L is a set of binary complement
c) L is a set of string with odd number of 0
d) L is a set of 0^n1^n L4 CO5

Q. 34 The Grammar can be defined as: $G=(V, \sum, p, S)$
In the given definition, what does S represents?
a) Accepting State b) Starting Variable c) Sensitive Grammar d) None of these L4 CO5

Q. 35 For a DFA accepting binary numbers whose decimal equivalent is divisible by 4, what are all the possible remainders?
a) 0 b) 0,2 c) 0,2,4 d) 0,1,2,3 L2 CO1

Q. 36 Which of the following is not a notion of Context free grammars?
a) Recursive Inference b) Derivations c) Sentential forms d) All of the mentioned L5 CO3

Q. 37 Which of the following is/are the suitable approaches for inferencing?
a) Recursive Inference
b) Derivations
c) Recursive Inference and Derivations d
) None of the mentioned L5 CO3

Q. 38 If w belongs to L(G), for some CFG, then w has a parse tree, which defines the syntactic structure of w. w could be:
a) program b) SQL-query c) XML document d) All of the mentioned L5 CO3

Q. 39 A->aA| a| b The number of steps to form aab:
a) 2 b) 3 c) 4 d) 5 L5 CO3

Q. 40 An expression is mentioned as follows. Figure out number of incorrect notations or symbols, such that a change in those could make the expression correct.
$L(G)=\{w \text{ in } T^* | S \rightarrow^* w\}$
a) 0 Errors b) 1 Error c) 2 Error d) Invalid Expression L5 CO3

Q. 41 Which of the following the given language belongs to?
$L=\{a^m b^m c^n | m>=1\}$
a) Context free language
b) Regular language
c) Context free language & Regular language
d) None of the mentioned L5 CO3

Q. 42 Which of the following statements are correct for a concept called inherent ambiguity in CFL?
a) Every CFG for L is ambiguous
b) Every CFG for L is unambiguous
c) Every CFG is also regular
d) None of the mentioned L5 CO3

Q. 43 Which of the theorem defines the existence of Parikhs theorem?
a) Parikh's theorem b) Jacobi theorem c) AF+BG theorem d) None of the mentioned L5 CO3

Q. 44 Choose the correct option:
Statement: There exists two inference approaches: Recursive Inference & Derivation
a) true b) partially true c) false d) none of the mentioned L5 CO3

a) wwr b) wSw
c) Equal number of a's and b's d) None of the mentioned L5 CO3

Q. 46 If L1 and L2 are context free languages, which of the following is context free?
a) L1* b) L2 U L1 c) L1.L2 d) All of the mentioned L4 CO5

Q. 47 For the given Regular expression, the minimum number of variables including starting variable required to derive its grammar is:
(011+1)*(01)*
a) 4 b) 3 c) 5 d) 6 L4 CO5

Q. 48 A grammar G=(V, T, P, S) is _____ if every production taken one of the two forms:
B->aC
B->a
a) Ambiguous b) Regular c) Non Regular d) None of the mentioned L4 CO5

Q. 49 Which among the following is a CFG for the given Language:
L={x∈{0,1}*|number of zeroes in x=number of one's in x}
a) S-> ε |0S1|1S0|SS
b) S->0B|1A| ε
A->0S
B->1S
c) All of the mentioned
d) None of the mentioned L4 CO5

Q. 50 Which of the following languages are most suitable for implement context free languages?
a) C b) Perl c) Assembly Language d) None of the mentioned L4 CO5

Q. 51 A push down automaton employs _____ data structure.
a) Queue b) Linked List c) Hash Table d) Stack L6 CO4

Q. 52 Which of the following allows stacked values to be sub-stacks rather than just finite symbols?
a) Push Down Automaton b) Turing Machine c) Nested Stack Automaton d) None of the mentioned L6 CO4

Q. 53 A non deterministic two way, nested stack automaton has n-tuple definition. State the value of n.
a) 5 b) 8 c) 4 d) 10 L6 CO4

Q. 54 Push down automata accepts _____ languages.
a) Type 3 b) Type 2 c) Type 1 d) Type 0 L6 CO4

Q. 55 Which of the operations are eligible in PDA?
a) Push b) Delete c) Insert d) Add L6 CO4

Q. 56 A string is accepted by a PDA when
a) Stack is not empty b) Acceptance state c) All of the mentioned d) None of the mentioned L6 CO4

Q. 57 A turing machine operates over:
a) finite memory tape b) infinite memory tape c) depends on the algorithm d) none of the mentioned L6 CO4

Q. 58 Which of the problems were not answered when the turing machine was invented?
a) Does a machine exists that can determine whether any arbitrary machine on its tape is circular.
b) Does a machine exists that can determine whether any arbitrary machine on its tape is ever prints a symbol
c) Hilbert Entscheidungs problem
d) None of the mentioned L6 CO4

Q. 59 Turing machine can be represented using the following tools:
a) Transition graph b) Transition table c) Queue and Input tape d) All of the mentioned L6 CO4

Q. 60 The ability for a system of instructions to simulate a Turing Machine is called _____.
a) Turing Completeness b) Simulation c) Turing Halting d) None of the mentioned L6 CO4

--- End of Question Paper---