3/12/24

RollNo.

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

Computer Science and Engineering

Semester IV

CS6202 & Theory of Computation

(Regulation 2018 - RUSA)

Time: 3 Hrs | Max.Marks: 100

CO1	Classify languages based on Chomsky hierarchy
CO2	Identify the class of language and design automata or Type x grammar
CO3	Prove equivalence of the different language representations within a class of the Chomsky hierarchy
CO4	Identify the undecidable problems and their class of languages
CO5	Apply and prove a given language is decidable or undecidable

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10 x 2 = 20 Marks)

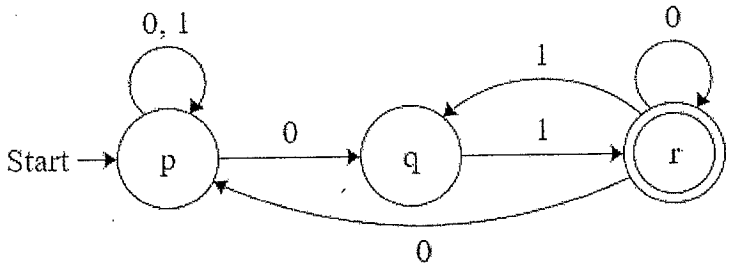
(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1.	Design a DFA accepting the language that set of all strings of 0's and 1's containing 011 as a substring.	2	2	2
2.	Design a ε-NFA for the set of strings consisting of zero or more a's followed by zero or more b's followed by zero or more c's.	2	3	4
3.	Write a regular expression for the set of all strings with alternating 0's and 1's.	2	3	2
4.	Find the reversal of a regular expression (0+1)*01 by applying reversal operations of regular expression.	2	2	3
5.	Write a context-free grammar for odd length palindromes.	2	3	1
6.	Show that the grammar E → E+E | E*E | (E) | id is ambiguous.	2	3	2
7.	Define the pumping lemma for context-free languages.	2	4	4
8.	What is halting problem of a Turing machine?	2	5	2
9.	Prove that the complement of recursive language is recursive.	2	4	3
10.	What are the actions performed in one move of a multi-tape Turing Machine?.	2	5	1

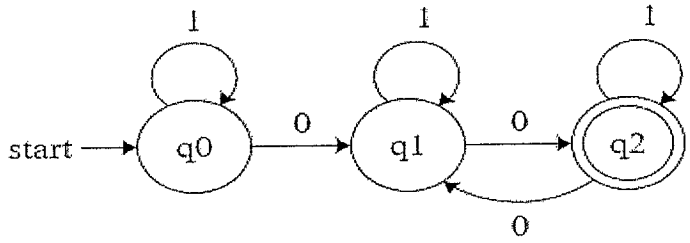
PART- B (8 x 8 = 64 Marks)

(Answer any EIGHT questions)

Q. No.	Questions	Marks	CO	BL
11.	Convert the following NFA to a DFA.	8	2	3



12.	i) Convert the regular expression (0+1)*10(01+1)* to automata. ii) Define pumping lemma for regular languages and prove the language L={ww | w is a string of 0's and 1's} is not regular.	4+4	2	3
13.	Find the regular expression equivalent to the following DFA.	8	3	3



14.	Construct the minimum-state automata equivalent to DFA given by transition table.	8		

States/ Input	0	1
→A	B	F
B	G	C
*C	A	C
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

15.	Prove that if L is a CFL and R is a regular language, then L ∩ R is a CFL.	8	3	2
16.	Write the steps to convert the CFG to PDA. Convert the following grammar to a PDA. E → I | E * E | E + E | (E) , I → a | b | Ia | Ib | I0 | I1	8	3	3

17.	Convert the grammar S→AA | 0, A→SS | 1 to a GNF.	8	2	4
18.	Design a pushdown Automata for the language L = {0^n1^m| n<=m<=2n}. Show the instantaneous description of the PDA for the string 00111.	8	3	4
19.	Design a deterministic PDA to accept the language L_{wcwr} = { wcw^R | w is in (0+1)*}. Show whether the input 110c011 is accepted by your DPDA.	8	4	3
20.	Design a Turing machine to accept the language L= { 0^n1^n | n>=1 }.	8	4	4
21.	Proper subtraction m-n is defined by max(m-n,0), that is, the result is m-n if m>=n and 0 if m<n. Design a Turing machine to compute proper subtraction.	8	5	3
22.	Prove that If both language L and its complement are RE, then L is recursive.	8	5	2

PART- C (2 x 8 = 16 Marks)

Q. No.	Questions	Marks	CO	BL
23.	Begin with the grammar: S -> 0A0 | 1B1 | BB A -> C B -> S | A C -> S | ε Eliminate ε-productions, unit productions, and useless symbols in safe order. Put the resulting grammar into Chomsky Normal Form.	8	3	3
24.	Explain the construction of an instance of post's correspondence problem (PCP) from an instance of modified PCP (MPCP) with example.	8	5	4

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