MODEL QUESTION PAPER : 2024-25

Course Code: BCSAT504

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VIDYAVARDHAKA COLLEGE OF ENGINEERING

Autonomous Institute, Affiliated to Visvesvaraya Technological University, Belagavi

Gokulam, 3rd Stage, Mysuru 570 002

Fifth Semester B.E. Examinations

COURSE NAME: Automata Theory

Duration: 3 hours **Max. Marks: 100**

INSTRUCTION TO STUDENTS

1) Answer <u>One Full</u> question from each module.

2) Three module questions are compulsory and the remaining two modules will have internal choice.

3) Each module carries 20 marks.

Q. No.	Module-I	Marks	BL	CO
1. (a)	Explain the following terms with an example each. (i) DFA and NFA (ii) Alphabets and Strings (iii) Operations on languages	7	L2	CO1
1. (b)	Apply the minDFSM(M:DFSM) algorithm to minimize the given DFA. δ | 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	8	L3	CO2
1. (c)	Design a DFA for the following languages: i) Language that has decimal strings which are divisible by 3. ii) L={w|wϵ{a,b}*: every w has odd number of a's and even number of b's.	5	L4	CO4
	Module-II			
2.(a)	Obtain the regular expression for the following languages: i) Strings of a's and b's having odd length. ii) $L = \{a^n b^m \mid n \geq 0, m \geq 0, n + m = even\}$	5	L3	CO2
2.(b)	State and prove pumping lemma for regular languages. Check whether the language L= $\{0^n \mid n \text{ is prime}\}$ is regular or not.	10	L4	CO3
2.(c)	Demonstrate how regular languages are closed under complementation and design an automaton for the same.	5	L4	CO4
	(OR)			

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3.(a)	Illustrate how regular languages are closed under union and concatenation with suitable examples.	**5**	**L3**	**CO2**
3.(b)	Analyse the regular expression from the given DFA using state elimination method. δ | a | b → *1 | 2 | {} *2 | 3 | 1 3 | 3 | 1	**10**	**L4**	**CO3**
3.(c)	Design a finite automaton for the given regular expression. i. (0+1) *0(0+1) *0 ii. 1*0(0+1) *	**5**	**L4**	**CO4**
	Module-III			
4.(a)	Construct an equivalent CNF for the given CFG by eliminating ε- productions, unit productions and useless productions. S ⟶ aACa A ⟶ B|a B ⟶ C|c C ⟶ cC| **ε**	**10**	**L3**	**CO2**
4.(b)	Analyse the given languages and construct a CFG for the same. i. L={a^n b^n c^m: n>=1, m>=0} ii. L={a^n b^{n+2} : n>=0} iii. L={w ∈ {a,b}*: $n_a(w)=n_b(w)$} iv. L={ww^R : w*} v. L={0^i1^j|i≠j,i>=0 and j>=0}	**10**	**L4**	**CO3**
	Module-IV			
5.(a)	Convert the given CFG into its equivalent PDA. S ⟶ aSb S ⟶ a | b | ε	**10**	**L3**	**CO2**
5.(b)	Examine the language $L = \{WCW^R : W \in \{a, b\}\}$ to construct a PDA and draw the transition diagram to check the ID : aabcbaa.	**10**	**L4**	**CO4**
	Module-V			
6.(a)	Explain the techniques for TM constructions.	**13**	**L2**	**CO1**
6.(b)	Illustrate that if M is a nondeterministic TM, there is a deterministic TM M_1 such that T(M)=T(M_1).	**7**	**L3**	**CO2**
	(OR)			
7.(a)	Explain the post-correspondence problem and halting problem for TM.	**13**	**L2**	**CO1**
7.(b)	Construct a Turing machine to accept a languages of palindrome over {a,b}.show string acceptance for the string “abaaba”.	**7**	**L3**	**CO2**