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Code No. : 16215

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**

**B.E. (C. S. E. : CBCS) VI-Semester Main Examinations, January-2021**

**Automata, Languages and Computation**

Time: 2 hours

Max. Marks: 60

*Note: Answer any NINE questions from Part-A and any THREE from Part-B*

**Part-A (9 × 2 = 18 Marks)**

Q. No.	Stem of the question	M	L	CO	PO															
1.	Write the regular expression for the following language: All the strings of 'a's and 'b's where every string end with 'abab'	2	2	1	1,2															
2.	Give DFA accepting the set of all strings containing 110 as a substring, over the alphabet {0, 1}.	2	2	1	1,2															
3.	List any four closure properties of regular languages.	2	1	2	1															
4.	Define a parse tree and give an example.	2	1	2	1															
5.	Write the definition of pushdown automata (PDA).	2	1	3	1															
6.	Eliminate useless symbols from the following grammar. S → AB   C A → aA   b B → bB   a C → aC	2	2	3	1,2															
7.	What is context sensitive grammar? How is it different from CFG?	2	2	4	1															
8.	When do you say that the Turing machine accepts a string?	2	2	4	1															
9.	Write any two examples of an undecidable problem.	2	2	5	1															
10.	State the Instantaneous description of the Turing machine.	2	2	5	1															
11.	Design NFA for the language defined over $\Sigma = \{0,1\}$ where strings begin with 0 and end with 1.	2	3	1	1,2															
12.	Define the language for the following Context-Free Grammar. $S \rightarrow 0S1 \mid 01$	2	2	2	1,2															
<b>Part-B (3 × 14 = 42 Marks)</b>																				
13. a)	Design an Automaton which identifies the identifiers in a C language program.	7	3	1	1,2															
b)	Convert the following DFA to a Regular expression	7	3	1	1,2															
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	0	1																		
→*p	s	p																		
q	p	s																		
r	r	q																		
s	q	r																		

14. a)	The following grammar generates prefix expressions $E \rightarrow +EE \mid *EE \mid -EE \mid x y$ Find the leftmost and rightmost derivations for the string $+*-xyxy$	7	3	2	1,2
b)	Show that $L = \{a^i b^j \mid j = i^2\}$ is not a regular language.	7	3	2	1,2
15. a)	Find if the given grammar is finite or infinite: $S \rightarrow AB, A \rightarrow BC a, B \rightarrow CC b, C \rightarrow a$	7	3	3	1,2
b)	Design Push Down Automata for the language $L = \{a^{2n}b^n \mid n \geq 1\}$ .	7	4	3	1,2
16. a)	Design a Turing machine to recognize the language $L = \{a^n cb^n \mid n \geq 1\}$ .	10	4	4	1,2
b)	Write about context sensitive language and its relation with Linear bounded automata.	4	2	4	1
17. a)	What are undecidable problems? Explain why the PCP problem is considered undecidable.	7	2	5	1
b)	Write short notes on NP-complete and NP-hard problems.	7	2	5	1
18. a)	Convert the following regular expression to NFA with epsilon transitions $011(0+1)^*$	7	3	1	1,2
b)	What is meant by ambiguity? How we can test the ambiguity of grammar?	7	4	2	1,2
19.	Answer any <i>two</i> of the following:				
a)	Find a grammar in CNF equivalent to the grammar $S \rightarrow bA aB, A \rightarrow bAA aS a, B \rightarrow aBB bS b$	7	4	3	1,2
b)	Explain the Halting problem of a Turing machine.	7	2	4	1
c)	Explain the basic concept of the Universal Turing Machine.	7	2	5	1

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	55
2	Knowledge on application and analysis (Level-3 & 4)	45
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	0

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