Hall Ticket Number:

Code No. : 15658 O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

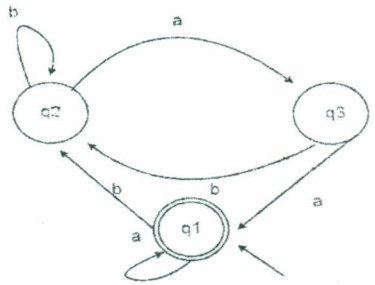
B.E. (I.T.) V-Semester Backlog Examinations, Jan./Feb.-2024

Automata Languages & Computation

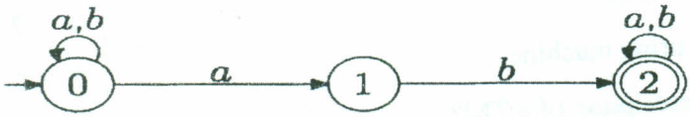
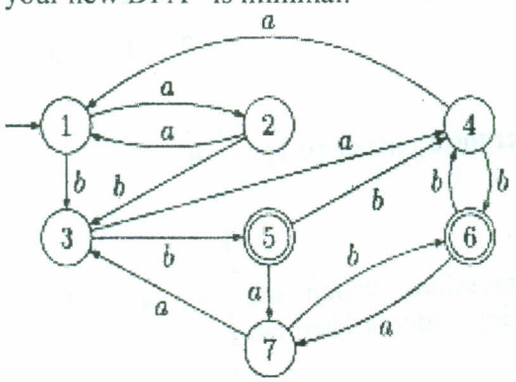
Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Differentiate between NFA and DFA.	2	1	1	1
2.	Construct DFA that accepts all strings of a's and b's where each string starts with 'a' over alphabet {a,b}.	2	3	1	1,2
3.	State decision properties of regular languages.	2	1	2	1
4.	Distinguish Type2 and Type1 grammars with an example	2	2	2	1
5.	Define PDA.	2	1	3	1
6.	State pumping lemma for CFL's.	2	2	3	1
7.	Define non-deterministic Turing machine.	2	1	4	1
8.	What is an instantaneous description of a TM?	2	2	4	1
9.	Distinguish between recursive and recursively enumerable languages.	2	2	5	2
10.	State Church-Turing hypothesis.	2	1	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	Give DFA's accepting the following languages over the alphabet {0,1}. (i) the set of all strings ending in 00 (ii) the set of all strings with 011 as a substring.	4	3	1	1
b)	State Arden's Theorem. Construct regular expressions which are equivalent to the following finite automata by applying Arden's Theorem 	4	4	1	1
12. a)	State and prove pumping lemma theorem for regular languages. Show that the language L= {a^n| n is a perfect square} is not regular.	4	2	2	1
b)	Explain Closure properties of regular languages with an example.	4	1	2	1
13. a)	Convert the following grammar (over the alphabet {a, b, c, d}) to the Chomsky normal form. S →aSd | T T →bTc | □	4	3	3	2

Contd... 2

b)	Apply CYK Algorithm on the input string "cbba" for the following CFG in ChomskyNormalForm and determine whether it is member of L(G) S→AB A→CC|a|c B→BC|b C→CB|BA|c	4	3	3	2
14. a)	Describe the programming techniques for Turing Machines.	4	2	4	1
b)	Design a TM to accept the language L= $\{0^n1^n2^n \mid n>=1\}$ and also show the sequence of moves made by the TM for the string "***001122***".	4	4	4	3
15. a)	Define PCP and MPCP. Given the MPCP instance shown below, construct PCP instance. List A= (110, 0011, 0110) List B= (110110, 00, 110)	4	3	5	1
b)	Discuss about Diagonalization language (L_d). Show that L_d is not recursively enumerable.	4	2	5	1
16. a)	Convert the following NFA to a DFA. Be sure to label each state in the DFA with the corresponding state(s) in the NFA.  	4	3	1	2
b)	Minimize the following Deterministic Finite Automata and prove that your new DFA is minimal.  	4	3	2	2
17.	Answer any ***two*** of the following:				
a)	Simplify the following grammar S→aA | aBB A→aAA | ε B→bB | b C→ B	4	2	3	1
b)	Design a TM to accept the language L= {wcw | w ∈ (a+b)*} and also show the sequence of moves made by the TM for the string "***aabcaab***".	4	2	4	1
c)	What is undecidability? How does this leads to untractability? Explain.	4	1	5	1

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

i)	Blooms Taxonomy Level – 1	23.68%
ii)	Blooms Taxonomy Level – 2	36.84%
iii)	Blooms Taxonomy Level – 3 & 4	39.47%

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