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Reg. No.

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VI Semester B.C.A. Degree Examination, September/October - 2022  
COMPUTER SCIENCE  
Theory of Computation  
(CBCS Scheme)

Time : 3 Hours

Maximum Marks : 100

*Instructions to Candidates :*

Answer all sections.

## SECTION - A

Answer any 10 questions. Each question carries 2 marks.

(10×2=20)

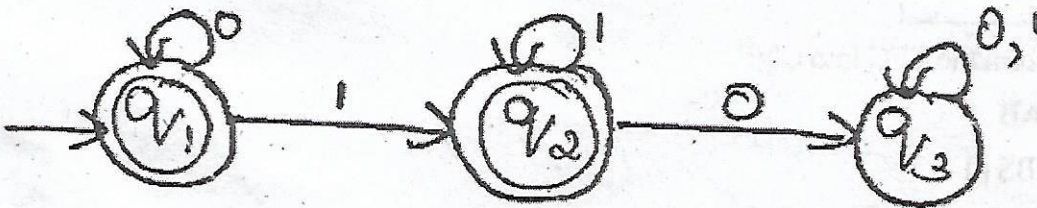
1. Define Automata.
2. Draw a DFA to accept strings of even number of a's.
3. What is trap state?
4. Define pumping Lemma?
5. Design a RE over  $\Sigma = \{a, b\}$  for the language accepting string of exactly length 2?
6. Define E-closure.
7. What are the different types of grammar?
8. What is parsing?
9. Define GNF.
10. Define Nullable variable.
11. What is Turing Machine?
12. State post correspondence problem.

## SECTION - B

Answer any 5 questions. Each question carries 5 marks.

(5×5=25)

13. Construct a DFA to accept strings of O's and I's representing zero modulo 5.
14. Write the differences between DFA and NFA.
15. Convert the DFA to Regular Expression.



[P.T.O.]



16. State and prove Kleene's Theorem.  
17. Prove that  $s \rightarrow a s b s / b s a s / \Sigma$  is ambiguous.  
18. Obtain CFG for the following language

$$L = \{a^n b^n \mid n \geq 1\}$$

19. Explain Halting problem of Turing Machine.  
20. Eliminate unit production from the following grammar.

$$S \rightarrow AB$$

$$A \rightarrow a$$

$$B \rightarrow C$$

$$B \rightarrow b$$

$$C \rightarrow D$$

$$D \rightarrow E$$

$$E \rightarrow a$$

### SECTION - C

Answer any 3 questions. Each question carries 15 marks :

(3×15=45)

21. Construct a NFA with E for  $(0+1)^*1(0+1)$ .  
22. Minimize the following DFA using table filling algorithm.

$\delta$	$a$	$b$
$A$	$B$	$C$
$B$	$G$	$C$
* $C$	$A$	$C$
$D$	$C$	$G$
$E$	$H$	$F$
$F$	$C$	$G$
$G$	$G$	$E$
$H$	$G$	$C$

23. Transform the CFG into GNF

$$S \rightarrow AB$$

$$A \rightarrow BS \mid 1$$

$$B \rightarrow SA \mid 0$$



(3)

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24. a) Find the language accepted by CFG

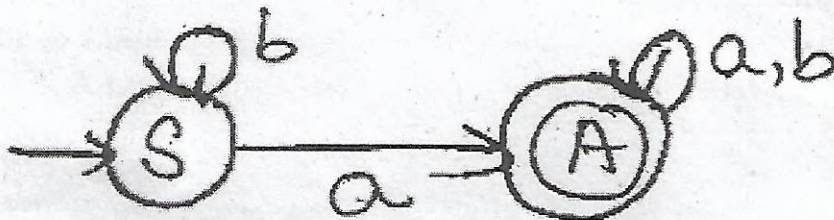
(5)

$$G = \{V, T, P, S\}, V = \{S\}, T = \{a, b\}$$

$$S = S, P = \{S \rightarrow aS / b\}$$

b) Obtain a grammar to generate string  $S = \{a, b\}$  having atleast one 'a'.

(5)



c) Obtain a PDA for the language

(5)

$$L = \{wcw^R / w \in (a, b)^*\}$$

25. Obtain a Turing machine that accepts the language  $L = \{a^n b^n \mid n \geq 1\}$ .

#### SECTION - D

Answer any 1 question.

(1×10=10)

26. Explain the types of Turing Machine

27. Write a note on Chomsky's Hierarchy of language.