

VI Semester B.C.A. Examination, September 2020  
(CBCS) (F+R) (2016-17 and Onwards)  
COMPUTER SCIENCE  
BCA 601 : Theory of Computation

Time : 3 Hours

Max. Marks : 100

**Instruction :** Answer all Sections.

## SECTION – A

Answer any ten questions. Each question carries two marks. (10×2=20)

1. Define Alphabet and Symbol with example.
2. Draw a Deterministic Finite Automata (DFA) to accept strings of even number of a's.
3. Define  $\epsilon$ -closure of a state.
4. State Arden's theorem.
5. Obtain a regular expression for the set of all strings that do not end with 01 over  $\Sigma = \{0, 1\}$ .
6. Write the meanings of the following regular expression :
  - i)  $0^* 1^* 2^*$
  - ii)  $(a + b)^* c$ .
7. Define Grammar.
8. What is parsing (derivation) ?
9. Find the language accepted by the following grammar.  
 $S \rightarrow aCa$   
 $C \rightarrow aCa|b$



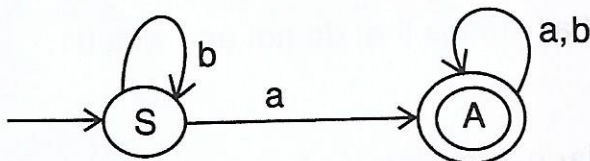
10. Define Chomsky Normal Form (CNF).
11. State post correspondence problem.
12. Mention various types of turing machines.

## SECTION - B

Answer **any five** questions. **Each** question carries **five** marks.

(5×5=25)

13. Obtain a DFA to accept strings of a's and b's ending with ab or ba.
14. Design NFA to accept the strings abc, acd and abcd.
15. Construct DFA for the regular expression  $ab^* + b$ .
16. Prove that the language  $L = \{WW^r/W \in (a + b)^*\}$  is not regular.  $W^r$  is the reverse of the string  $W$ .
17. Obtain grammar for the following DFA.



18. Eliminate left recursion from the grammar.

$$S \rightarrow Ab/a$$

$$A \rightarrow Ab/Sa$$

19. Construct a PDA to accept the language  $L = \{a^n b^{2n}/n \geq 1\}$  by final state.  
(PDA : Push Down Automata)
20. Explain the model of turing machine with mathematical representation.

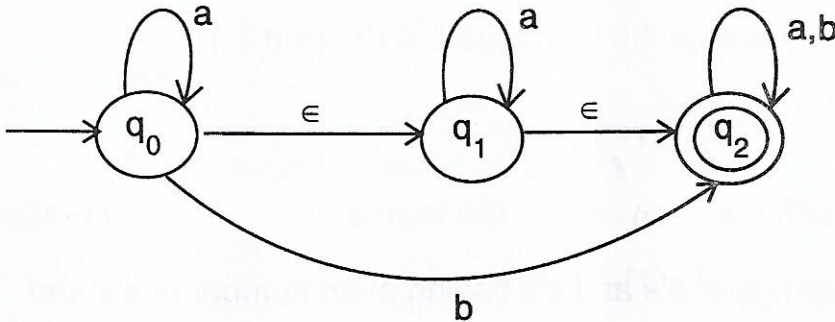


SECTION - C

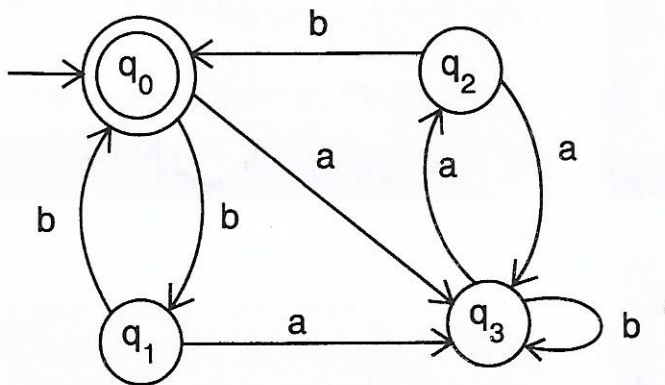
Answer any three questions. Each question carries fifteen marks.

(3×15=45)

21. Convert the following  $\epsilon$ -NFA to its equivalent DFA.



22. Minimize the following DFA.



23. a) Explain Noam Chomsky hierarchy of generative grammars with suitable examples. 8

b) Define ambiguous grammar and show that the following grammar is ambiguous

$$S \rightarrow aB/bA$$

$$A \rightarrow aS/bAA/a$$

$$B \rightarrow bS/aBB/b$$

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24. a) Eliminate unit productions from the following grammar. 8

$$S \rightarrow AB$$

$$A \rightarrow D$$

$$D \rightarrow a$$

$$B \rightarrow F$$

$$F \rightarrow b$$



b) Eliminate  $\epsilon$ -productions from the following grammar.

$S \rightarrow AB$

$A \rightarrow aAA/\epsilon$

$B \rightarrow bBB/\epsilon$

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25. Obtain a turning machine to accept the language  $L = \{0^n 1^n / n \geq 1\}$ .

15

### SECTION - D

Answer any one question. Each question carries ten marks.

(1×10=10)

26. Obtain a DFA to accept strings of a's and b's having even number of a's and even number of b's.

27. Define Greibach Normal Form (GNF). Convert the following context free grammar into GNF.

$S \rightarrow AB$

$A \rightarrow BSB$

$A \rightarrow a$

$B \rightarrow b$