

Roll No. 2309000022

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**BCA-C-302**

**Bachelor of Computer Applications  
(Third Semester)**

**EXAMINATION, 2024-25**

**THEORY OF COMPUTATION**

*Time :  $2\frac{1}{2}$  Hours*

*Maximum Marks : 60*

**Note :** All questions have to be attempted.

**Section—A**

1. Multiple Choice Questions : 1 each

(a) The language is represented by the regular expression  $(a + b)b$ , produces strings that :

(CO1, BL-3)

- ☒ (i) Must contain b as last symbol
- ☐ (ii) Must contain ab as last symbol
- ☐ (iii) Must contain ba as first symbol
- ☐ (iv) None of the above

**P. T. O.**



(b) In Mealy machine for  $n$  input, the output is :

(CO2, BL-3)

~~(i)~~  $n$

(ii)  $n^2$

~~(iii)~~  $n + 1$

(iv)  $2n + 1$

(c) Finite automata accept which among the following languages ? (CO2, BL-2)

~~(i)~~ Regular language

(ii) Context free language

(iii) Recursive enumerable language

(iv) Context sensitive language

(d) Type 2 grammar generates : (CO4, BL-2)

(i) Regular language

~~(ii)~~ Context free language

(iii) Context sensitive language

(iv) Recursive language

(e) For ambiguous grammar which is correct ?

(CO3, BL-2)

(i) There exists exactly one derivation tree.

① ~~(ii)~~ There exists more than one derivation tree.

(iii) There exists exactly two derivation tree.

(iv) None of the above

(f) Mealy and Moore machines are also called :

(CO2, BL-3)

(i) Language acceptors

① ~~(ii)~~ Output generators

(iii) Both (i) and (ii)

(iv) None of the above

(g) Dead transition is allowed in : (CO1, BL-2)

(i) Deterministic Finite Automata

① ~~(ii)~~ Non-deterministic Finite Automata

(iii) Both (i) and (ii)

(iv) None of the above

(h) Push Down Automata consists : (CO4, BL-2)

① (i) A Memory Called Stack

(ii) An Input Tape

(iii) A Finite Control Unit

~~(iv)~~ All of the above



(i) Which of the following is regular set ?

(CO1, BL-3)

~~(i)~~  $\{0^n 1^{2m} \mid n \geq 0, m \geq 0\}$

(ii)  $\{0^n 1^m \mid n = 4m, n \geq 0\}$

(iii)  $\{0^n 1^{2n} \mid n = 2^{|BCA|}\}$

(iv) None of the above

(j) Push Down Automata accept : (CO4, BL-2)

~~(i)~~ Context Free Language

(ii) Context Sensitive Language

(iii) Regular Language

(iv) None of the above

(k) Mealy machine contains : (CO2, BL-2)

(i) 5 tuples

~~(ii)~~ 6 tuples

(iii) 4 tuples

(iv) 7 tuples

(l) A finite automata contains : (CO2, BL-2)

~~(i)~~ 5 tuples

(ii) 6 tuples

(iii) 7 tuples

(iv) 8 tuples



2. Answer any *four* of the following (Short answer type questions) : 3 each

(a) Discuss decidability and undecidability with suitable example. (CO5, BL-2)

(b) Differentiate between Deterministic Finite Automata and Non-deterministic Finite Automata. (CO2, BL-4)

(c) Differentiate between Mealy machine and Moore machine with suitable examples. (CO2, BL-4)

(d) Discuss pumping lemma for regular language with suitable example. (CO3, BL-2)

(e) Discuss the Halting problem. (CO5, BL-2)

### Section—B

#### (Long Answer Type Questions)

3. Attempt any *two* of the following : 6 each

(a) Design a Push Down Automata for language : (CO4, BL-6)

$$L = \{wcw^r \mid w \in (a,b)^*\}.$$

(b) Design a DFA and transition table for the language which starts with *abb*. (CO2, BL-6)

(c) Design Total Language Tree for the given grammar : (CO3, BL-6)

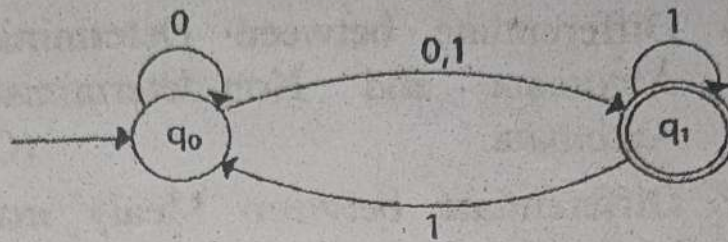
$$S \rightarrow bb|aX|bXX$$

$$X \rightarrow a|ba$$



4. Attempt any *two* of the following : 6 each

- (a) Convert the following NFA to DFA and also draw the transition tables : (CO2, BL-6)

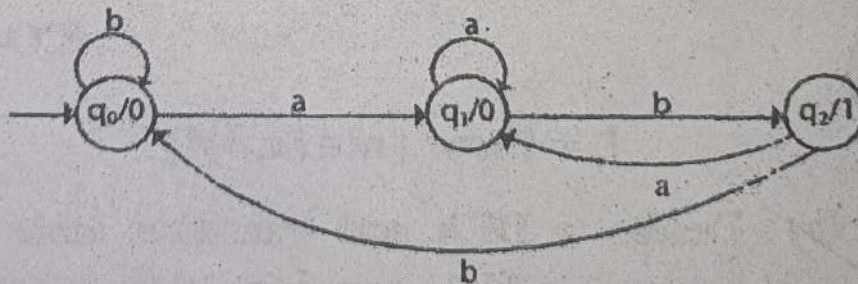


- (b) Construct a DFA for a language in which all the strings start with either *aa* or *bb*. (CO2, BL-6)

- (c) Discuss pumping lemma theorem for Context Free Language. (CO4, BL-2)

5. Attempt any *two* of the following : 6 each

- (a) Convert the following Mealy Machine in Moore Machine by using transition table and transition diagram : (CO2, BL-3)



- (b) Explain Context Free Grammar. Write a CFG for CFL,  $L = \{a^n b^{n+1} \mid n > 0\}$ . (CO3, BL-2)

- (c) Explain Chomsky Hierarchy in detail with suitable diagram. (CO4, BL-2)