

U.G. 5th Semester Examination - 2020

BCA

Course Code : BBCACCHT501

Course Title : Theory of Computation

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer the any **ten** questions: $1 \times 10 = 10$
- What is the significance of the symbol Σ in formal language?
 - What do you mean by useless production?
 - Define Kleene Star.
 - Find all string of length 2 or less from language $L = \{a^n \mid n \geq 1\}$.
 - What is left linear grammar?
 - Draw DFA of the regular expression – $(a + b)^*$ over $\Sigma = \{a, b\}$
 - If $L = \{a^n b^n \mid n \geq 0\}$ then obtain L^2 .
 - Define Turing Machine.

[Turn over]

- What is Null Production in grammar?
 - What is acceptor?
 - State Arden's Lemma.
 - State Pigeonhole principle.
 - What is transition table?
 - Define type-O grammar.
 - What do you mean by Automata?
2. Answer any **five** questions: $2 \times 5 = 10$
- Write down the regular expressions of the following language over $\Sigma = (0,1)$.
Set of all string ending with '01'.
 - What do you mean by language acceptance by FA?
 - Find the finite automation that accept $L = \{(ab)^n \mid n > 0\}$.
 - On the alphabet $\Sigma = \{x, y, z\}$ find the star closure of the language $L = \{y^2\}$.
 - Define Chomsky Normal Form.
 - Generate the context free grammar for the language $L = \{a^n b^m \mid n \neq m\}$.
 - What are the applications of pumping lemma?
 - Define δ^* for DFA.

611/BCA

[2]

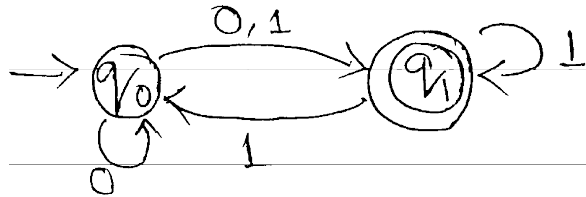
3. Answer any **two** questions: 5×2=10

- a) i) What is ϵ production?
 ii) Consider the CFG $G = (\{S, X, Y\}, \{a, b\}, P, S)$ where P consist of –

$$\begin{aligned} S &\rightarrow a | Xb | aYa \\ X &\rightarrow Y | \epsilon \\ Y &\rightarrow b | X \end{aligned} \qquad 1+4=5$$

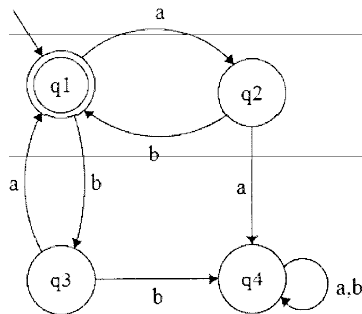
Remove ϵ production.

- b) i) Distinguish between NFA and DFA.
 ii) Convert the given NFA to DFA:



2+3=5

- c) i) What do you mean by Regular expression?
 ii) Find out the regular expression for the following DFA: 1+4=5



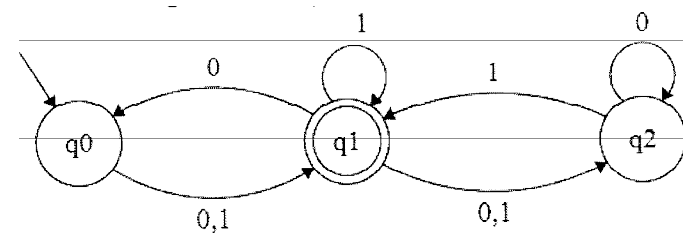
[3]

[Turn over]

4. Answer any **one** question: 10×1=10

- a) i) Write down the main features of standard Turing Machine.
 ii) For $\Sigma = \{0, 1\}$, design a Turing Machine that accept the language denoted by the regular expression 00^* . 2+8=10
- b) i) Prove that if L_1 and L_2 are regular languages then so also $L_1 \cap L_2$.
 ii) $L(G) = \{a^m b^n \mid m > 0 \text{ and } n \geq 0\}$ we have to find out grammar G which produces $L(G)$. 4+6=10

- c) i) Define NFA with ϵ -transition and also define a language accepted by NFA- ϵ .
 ii) Convert the following NFA into equivalent DFA:



(2+2)+6=10

[4]