

Roll No.

OLE-24266

B. Tech. 5th Semester (CSE)

Examination – April, 2021

THEORY OF AUTOMATA COMPUTATION

Paper : CSE-305-F

Time : Three Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

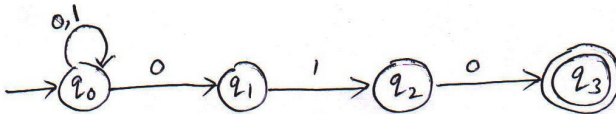
Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. **1** is *compulsory*. All questions carry equal marks.

1. (a) Draw a diagram of DFA and NDFA and write any *two* differences by mentioning in theory about the differences given in the diagram that you have drawn. $4 \times 5 = 20$
- (b) Can we use pumping lemma to prove that certain languages are regular ? Justify your answer.
- (c) Which machine have more computing power Pushdown automata or Turing machine. Justify your answer.

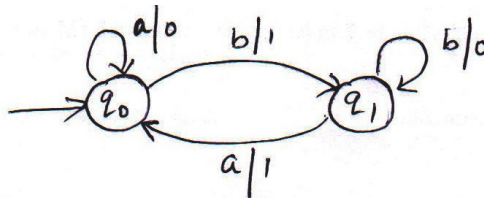
- (d) Explain the use of composition function in primitive recursive function. Also explain the same by taking a suitable example.
- (e) What are Null productions and why they are useless in CFG ? Explain by taking a suitable example.

SECTION – A

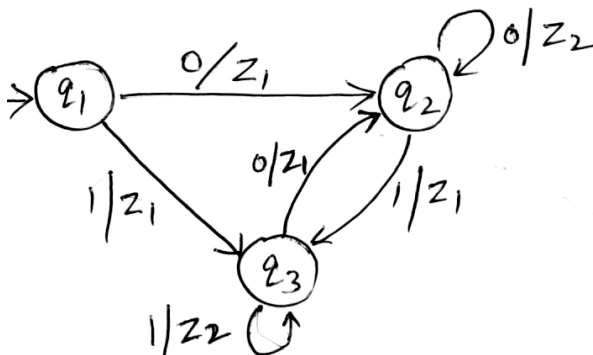
2. (a) Convert the following NFA to DFA : 10



- (b) Convert the Mealy machine into the Moore Machine : 10



3. (a) Convert the following Mealy Machine to Moore Machine : 10



- (b) Design a FA which accept the language L such that $L = \{ \omega \in (0, 1)^*, \omega \text{ has both an odd number of a's and odd number of b's.} \}$ 10

SECTION – B

4. (a) Consider the C.F.G. and derive the string $\omega = \text{baabaabb}$ from the given grammar which is $S \rightarrow aSbS / bSaS / \epsilon$. 10

- (b) Convert the grammar into GNF : 10

$$S \rightarrow Aba / a$$

$$A \rightarrow aaA / B$$

$$B \rightarrow bAb$$

5. (a) Show that $L = \{ a^n b^n c^n \mid n \geq 1 \}$ is not regular. 10

- (b) Construct a reduced grammar equivalent to the grammar : 10

$$S \rightarrow aAa$$

$$A \rightarrow Sb \mid bCC \mid DaA$$

$$C \rightarrow abb \mid DD$$

$$E \rightarrow aC$$

$$D \rightarrow aDA$$

SECTION – C

6. (a) Define Turing Machine. Draw the model of T.M and explain its parts. Discuss the mathematical definition of DTM and NDTM. 10

- (b) Design a PDA to accept language of all kinds of palindromes over {a, b}. 10
7. (a) Construct a PDA to accept language L (Transition diagram and table both) : 10
- $$L = \{0^n 1^{n+2} \mid n \geq 1\}$$
- (b) Design a T.M. which decrements the input decimal number by 1. Also perform the trace of machine by taking a suitable example. 10

SECTION – D

8. (a) Explain the complete details of Chomsky hierarchy of languages. 14
- (b) Explain the zero function and concept of recursion in Primitive Recursive Functions. 6
9. (a) How the Addition, multiplication, exponentiation can be defined using Primitive recursive function ? Explain with the help of successor and composition functions only. 10
- (b) Show the following functions are primitive recursive :
- (i) Transpose 5
- (ii) Identity Function 5