Total No. of Questions : 5]

SEAT No. : ____

P-1305

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T.Y. B.Sc.

COMPUTER SCIENCE

CS - 356 : Theoretical computer science

(2019 Pattern) (CBCS) (Semester - V)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) **Attempt any Eight of the following : (out of TEN)** **[8 × 1 = 8]**

a) Write output function λ of Moore and Mealy machines.

b) List all the proper prefixes of the string "ABCD'.

c) Define Nullable symbol.

d) Give formal definition of Pushdown Automata.

e) Define right linear grammar.

f) State True or False. DFA do not have multiple final states.

g) Name the type of language accepted by Turing Machine.

h) Write the tuples of LBA.

i) State true or false. Pumping lemma is used to show that language is not context tree.

j) Write smallest possible string accepted by the following regular expression. l0+(0+l 1)0*1

Q2) **Attempt <u>any four</u> of the following :** **[4 × 2 = 8]**

a) Explain Reduction with the help of example.

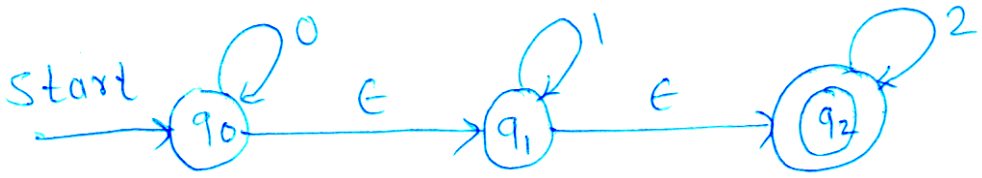
b) Construct FA for regular expression.

(0l+l0)*+ 11

c) Differentiate between DFA and NFA.

P.T.O.

d) Write down the ∈-closure of each state from the following FA.



e) Define types of Turing Machine.

Q3) **Attempt <u>any two</u> of the following : (Out of THREE)** **[2 × 4 = 8]**

a) Construct a DFA for a language over Σ = {0,1 }

L1∩L2

L1 = { All strings starting with '0'}

L2 = { All strings not having '01' as substring}

b) Construct the following CFG int Normal Form (CNF)

S-> aSa | bSb | a | b| aa | bb

c) Construct TM which accepts the language that start with 0 and ends with 1.

Q4) **Attempt <u>any two</u> of the following : (Out of THREE)** **[2 × 4 = 8]**

a) Construct a PDA for the language L = $\{a^n b^n \mid n>=1\}$

b) Construct a Mealy machine for the language L over Σ = {0, 1} which outputs 'A' if it has substring '101'. it outputs 'B' if it has substring '110', otherwise it outputs 'C'.

c) Write a short note on Chomsky's hierarchy.

Q5) **Attempt <u>any one</u> of the following : (Out of TWO)** **[1 × 3 = 3]**

a) Construct a Moore machine over alphabet {0,1} to get l's compliment of a given binary string.

b) Show that L = $\{0^n 1^n \mid n>=1\}$ is not regular.