Total No. of Questions : 5]

SEAT No. :

PE-1516

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T.Y. B.Sc.

COMPUTER SCIENCE

CS-356 : Theoretical Computer Science

(Rev. 2019) (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) Define term Empty string with example.

b) State True or False "DFA do have multiple final state."

c) Write down the E-closure of each state from the following FA.



d) Define Unit production.

e) Which tool is used to prove that the language is not regular.

f) Write smallest possible string accepted by the following regular expression. a(a+b)*ab

g) Define δ in case of PDA.

h) Define right linear grammar.

i) Give Formal definition of Turing Machine.

j) Define λ in case of Moore Machine.

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

a) Differentiate between FA and PDA.

b) Construct FA for regular expression. (a+b)* bb.

c) Explain derivation process with the help of example.

d) Write a Regular Expressions for a language :
Over ∑{0,1} such that string start with '01' and end with '10'.

e) Explain NPDA.

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Q3) **Attempt any two of the following (Out of three) :** **[2 × 4 = 8]**

a) Costruct a DFA for a language which contains all strings ending with "ab" or "bc" over ∑{a,b,c}.

b) Convert the following CFG into CNF.

$S \rightarrow ABA$

$A \rightarrow aA \mid \in$ (epsilon)

$B \rightarrow bB \mid \in$ (epsilon)

c) Design a TM for a language

$L = \{a^n b^n \mid n \geq 1\}$

Q4) **Attempt any two of the following (Out of three) :** **[2 × 4 = 8]**

a) Construct a PDA for a language

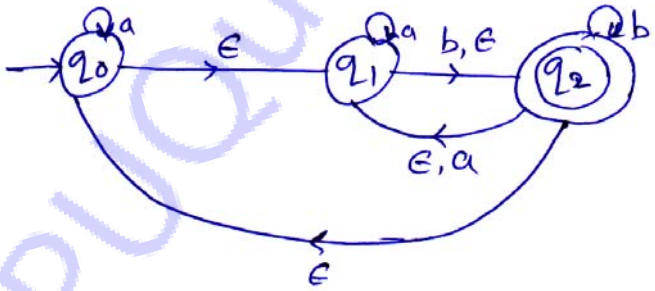
$L = \{a^{2n} b^n \mid n \geq 1\}$

b) Design a Mealy Machine for input (a+b+c)* if input ends with "bac" print A else print 'B'.

c) Give the difference between DFA and NFA.

Q5) **Attempt any one of the following (Out of two) :** **[1 × 3 = 3]**

a) Convert the following NFA with empty moves to DFA.



b) Prove $L = \{a^n b^n a^n \mid n \geq 1\}$ is not regular.



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