Please check that this question paper contains_____ questions and _____ printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: .....]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

Name of Subject: **Formal Language and Automata Theory**

Subject Code: **PCCS-110**

Paper ID: **16430**

MORNING

10 MAY 2023

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) Explain the different ways in which a PDA accepts the language?

b) Describe the recursively Enumerable Language with example?

c) State pumping lemma for regular grammars.

d) Eliminate the useless symbols from the following grammar

S->AB|DS A->a B->c C->D D->Dd|Ɛ E->a

e) Construct a grammar for the language L = $(WcW^R \mid w \in \{a, b\}^*$. Reverse of w is denoted as wR

f) Is the grammar {E→E+E|E-E|id}ambiguous? Why?

Part – B **[Marks: 04 each]**

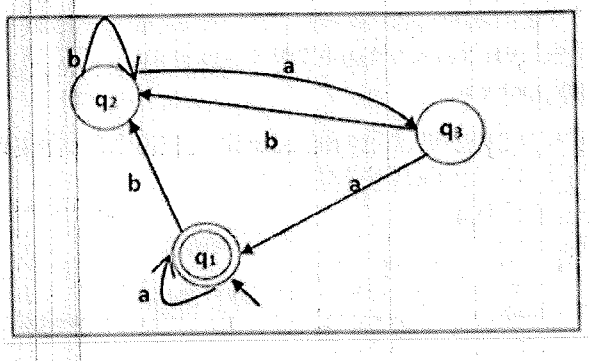
Q2. Discuss in detail Linear Bounded Automata.

Q3. Compare Mealy Machine with the Moore Machine.Also, explain the procedure to convert Moore Machine to Mealy machine using an example.

Q4. Construct NFA without ε – transitions from the following NFA.

M=({q0, q1,q2}, {a, b, c}, δ , q0, {q2}) and δ(q0 , a) = {q0}, δ(q0 , b) = {q1}, δ(q0 , c) = {q2} δ(q1 , ε) = {q0}, δ(q1 , a) = {q1}, δ(q1 , b) = {q2}, δ(q2 , ε) = {q1}, δ(q2 , a) = {q2}, δ(q2 , c) = {q0}.

Q5. Derive the regular expression of given automata using Arden's theorem



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Q6. Convert the given context-free grammar G into Chomsky Normal Form.

S --> AaA | CA | BaB
A --> aaBa | CDA | aa | DC
B --> bB | bAB | bb | aS
C --> Ca | bC | D
D --> bD | ε
ε represents null.

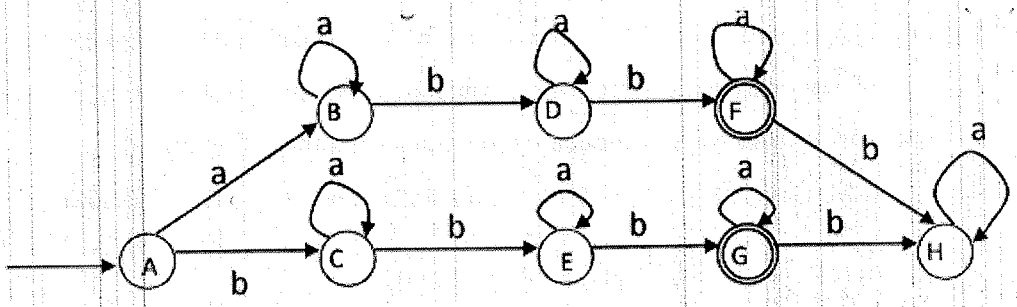
Q7. Construct a DFA for the language over {0, 1}* such that it contains "000" as a substring

Part – C **[Marks: 12 each]**

Q8. How Noam Chomsky classified the formal languages? Discuss each class with the help of suitable examples . Also find the grammar for the language given below: $L=\{a^n b^n c^i | n \geq 1, i \geq 0\}$

OR

What do you mean by equivalence of states in a Finite Automata? Construct a Minimum state Automaton equivalent to DFA given below



Q9. Design a Turing machine *M* to recognize the language $\{1^n 2^n | n \geq 1\}$.Draw its state transition table and diagram. Obtain the computation sequence of *M* for processing the input string 1122.

OR **PTO**

What is the difference between PDA acceptance by empty stack and final state?

Construct a deterministic pda accepting

$L = \{W \in \ | \ the\ number\ of\ 1's\ in\ w\ equals\ the\ number\ of\ 0's\ in\ w\}$ by final state. Trace the instatneous description for w = 100011.

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