MANIPAL ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Reg. No.										

DEPARTMENT OF SCIENCES,
III SEMESTER M.Sc (Applied Mathematics and Computing)
END SEMESTER EXAMINATIONS, MARCH 2021

SUBJECT: Formal Language and Theory of computation [MAT 5001]

(REVISED CREDIT SYSTEM-2017)

Time: 3 Hours Date:24.03.2021 MAX. MARKS: 50

Note : All questions carry equal marks (3 + 3 + 4)

1A. Sketch and Describe the block diagram of a Finite automaton

1B. Prove that if L is regular then L^T is also regular. Give an example.

1C. Design FA which checks whether a given decimal number is divisible by four.

Verify the same for the number 456789 and write a corresponding path.

2A. Define Mealy machines.

With suitable explanation, construct an equivalent Machine for the given Machine and draw its transition diagram.

State	i.p. a=0		i.p. a=1	
	state	o.p.	state	o.p.
$\rightarrow q_1$	q_3	0	q_2	0
q_2	q_1	1	q_4	0
q_3	q_2	1	q_1	1
q_4	q_4	1	q_3	1

2B. Is $\underset{G}{\Rightarrow}$ an equivalence relation on $(V_N \cup V_T)^*$?

2C. Show that the set $L=\{a^p \mid p \text{ is a prime }\}$ is not regular.

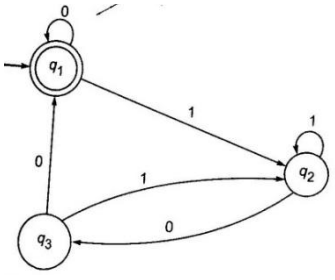
3A. Let L be the set of all palindromes over {a,b}.Construct a grammar G generating L.

3B. State and prove Arden's theorem..

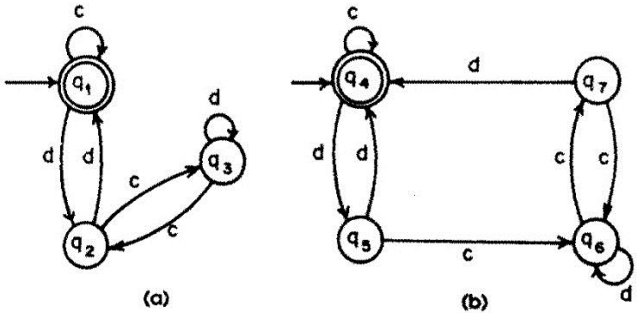
3C. Construct a regular grammar G generating the regular set represented by $a^*b\ (a+b)^*$.

4A. Construct a reduced grammar equivalent to the grammar G whose productions are $S \rightarrow AB|CA,\ B \rightarrow BC|AB,\ A \rightarrow a,\ C \rightarrow aB \mid b$

4B. Construct a regular expression corresponding to the following FA shown in figure using algebraic method.



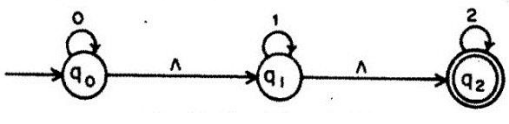
4C. Define comparison method. Determine whether the given two machines are equivalent.



5A. Define Greibach normal form of a language.
Convert the grammar $S \rightarrow AB, A \rightarrow BS \mid b, B \rightarrow SA|a$ into GNF.

5B. Show that the grammar $S \rightarrow aB \mid ab,\ A \rightarrow aAB|a, B \rightarrow ABb|b$ is ambiguous

5C. Obtain an equivalent automaton without $\in$ moves with proper explanation to the figure below.



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