

II B. Tech II Semester Supplementary Examinations, November - 2020
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Give the mathematical representation of Finite State Machine. [4M]
- b) Differentiate between CFG and CFL. [4M]
- c) Define δ in NFA with ϵ (Epsilon) moves. [3M]
- d) Write the properties of regular sets. [4M]
- e) Obtain CFG for the language $L = \{ 0^{n+2} 1^n : n \geq 1 \}$. [3M]
- f) What is undecidable problem? How can it be solved? [4M]

PART -B

2. a) Discuss the various models of Computation. [8M]
- b) Design a Finite State Machine (FSM) that will take an arbitrary-sized integer as input, one bit at a time (starting from most significant bit), and return the remainder after this integer is divided by 3. [8M]
3. a) Prove that every context sensitive language is recursive. [8M]
- b) What is recursive enumerable language? Explain its properties. [8M]
4. a) Construct a DFA to accept strings over $\{a,b\}$ such that every block of length five contains atleast two a's. Use transition function to trace a string $W=aabba$. [8M]
- b) Construct the equivalent DFA for the following ϵ - NFA by computing the ϵ - closure of each state. [8M]

	ϵ	a	b	c
$\rightarrow p$	ϕ	$\{p\}$	$\{q\}$	$\{r\}$
q	$\{p\}$	$\{q\}$	$\{r\}$	ϕ
* r	$\{q\}$	$\{r\}$	ϕ	$\{p\}$

5. a) Construct the minimum state equivalent DFA for the following DFA [8M]

δ	0	1
$\rightarrow A$	B	F
B	G	C
*C	A	C
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

- b) Let $\Sigma = \{a,b\}$. Show that the language $L = \{ W \in \Sigma^* \mid n_a(W) < n_b(W) \}$ is not regular. [8M]

6. a) Give the Mealy and Moore machine for input from $(0+1+2)^*$ and print the residue modulo 5 of the input treated as a ternary. [8M]
- b) What is GNF? Convert the following grammar to GNF:
 $S \rightarrow AB1 \mid 0$
 $A \rightarrow 00A \mid B$ [8M]
 $B \rightarrow 1A1$
7. a) Design a Turing machine to accept the set of all palindromes over $\{0,1\}^*$. [8M]
- b) Prove that every language accepted by multi tape Turing machine is recursively enumerable. [8M]