2019
FORMAL LANGUAGE AND AUTOMATA THEORY
IT403

TIME ALLOTTED: 3HRS **FULL MARKS:70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

1. Answer any ten from the following, choosing the correct alternative of each question: **10×1=10**

CO No.

1. i) In Moore machine, output is produced over the change of: **IT403.2**

a) Transitions
b) State
c) Both
d) None of above

ii) Which of the following is a not a part of 5-tuple finite automata? **IT403.2**

a) Input alphabet
b) Transition Function
c) Initial State
d) Output Alphabet

iii) Statement 1: Null string is accepted in Moore Machine. **IT403.2**
Statement 2: There are more than 5-Tuples in the definition of Moore Machine.

a) Statement 1 is true and Statement 2 is true
b) Statement 1 is false and Statement 2 is true
c) Statement 1 is true and Statement 2 is false
d) Both are false

iv) A Turing machine is a **IT403.1**

a)real machine
b) abstract machine
c) hypothetical machine
d) All of these

v) A Turing machine operates over: **IT403.1**

a) finite memory tape
b) infinite memory tape
c) depends on the algorithm
d) none of the mentioned

vi) While applying Pumping lemma over a language, we consider a string w that belong to L and fragment it into _____ parts. **IT403.3**

a) 2
b) 5
c) 3
d) 6

vii) There are _____ tuples in finite state machine. **IT403.1**
a) 4
b) 5
c) 6
d) unlimited

viii) Transition function maps.
a) Σ * Q -> Σ
b) Q * Q -> Σ **IT403.1**
c) Σ * Σ -> Q
d) Q * Σ -> Q

ix) Language of finite automata is. **IT403.1**
a) Type 0
b) Type 1
c) Type 2
d) Type 3

x) Which of the following production is in CNF? **IT403.3**
a) S ->aA
b) SA -> AS
c) S -> AB
d) All of these

xi) A language is regular if and only if **IT403.2**
a) accepted by DFA
b) accepted by PDA
c) accepted by LBA
d) accepted by Turing machine

xii) Grammar that produce more than one Parse tree for same sentence is: **IT403.1**
a) Ambiguous
b) Unambiguous
c) Complementation
d) Concatenation Intersection

GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following) **3 x 5 = 15**

			CO No.
2	a) State Pumping lemma	**02**	**IT403.3**
	b) Find whether the Language L= **$\{a^{n!}$ where n>=0$\}$** is regular or not?	**03**	**IT403.3**
3	a) State the working principle of Turing m/c.	**02**	**IT403.1**

b)Convert the following Mealy m/c to its corresponding Moore m/c **03** **IT403.2**

PS	NS,Z	
	X=0	X=1
Q0	Q1 , 1	Q2 , 1
Q1	Q3 , 0	Q0 , 1
Q2	Q4 , 0	Q3 , 1
Q3	Q1 , 0	Q4 , 0
Q4	Q2 , 1	Q4 , 0

4 Design a modulo 8 Binary Counter with T Flip-Flop implementation **05** **IT403.4**

5 a) Draw transition diagram for the regular expression 10+(0+11)+0*1 **03** **IT403.3**

b) What is regular expression? **02**

6 a) Draw a DFA for the language accepting strings ending with 'abba' over input alphabets $\sum = \{a, b\}$ **05** **IT403.3**

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following) **3 x 15 = 45**

CO No.

7. a) Design a 2-i/p and 2-o/p sequence detector which will detect a sequence 1101 and produce one as Output else will produce zero as output. **09** **IT403.1**

b) Minimize the following completely specified m/c **06** **IT403.1**

PS	NS,Z	
	X=0	X=1
A	E,1	D,0
B	E,0	C,1
C	A,0	B,0
D	A,0	D,1
E	A,1	B,0

8. a) Check the Definiteness of the following m/c, if definite, find out its order **05** **IT403.1**

PS	NS,Z	
	X=0	X=1
A	A,1	C,1
B	E,0	B,1
C	D,0	A,0
D	C,0	B,0
E	B,1	A,0

b) Convert the following grammar into FA **05** **IT403.3**

S→aA/bB/a/b

A→aS/bB/b

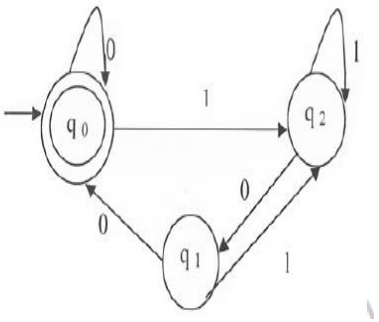
B→aA/bS

c) Design Merger Table & Merger Graph for the following incompletely specified m/c **05** **IT403.2**

PS	NS,Z		
	I1	I2	I3
A	C,0	E,1	---
B	C,0	E,--	---
C	B,--	C,0	A,--
D	B,0	C,--	E,--
E	---	E,--	A,--

9. a) State and prove Arden's Theorem **05** **IT403.2**

b) Construct the regular expression corresponding to the state diagram given below : **05** **IT403.3**



c) Prove that
(1+00*1)+(1+00*1)(0+10*1)*(0+10*1) = 0*1(0+10*1)* **05** **IT403.3**

10. a) Convert the following grammar to CNF.

S ->aA/B/C/a
A ->aB/E
B ->aA
C ->cCD
D ->abd

05 **IT403.3**

b) Let G be the grammar S->0B|1A, A->0|0S|1AA, B->1|1S|0BB. For the string 00110101, find, **07** **IT403.3**

i> the leftmost derivation.
ii> the rightmost derivation.
iii> the derivation tree.

c) Define non-generating and non-reachable symbols with example. **02** **IT403.1**

d) What is ambiguous grammar ? **01** **IT403.1**

11. a) Construct a DFA from the NFA given below: **05** **IT403.3**

Q/∑	**0**	**1**
→ q0	**q0,q3**	**q0,q4**
q3	**qf**	**-----**
q4	**-----**	**qf**
qf (final state)	**qf**	**qf**

b) Compare between DFA and NFA **03**

c) Construct a PDA equivalent of the following CFG: **05** **IT403.3**

G= (V,T,P,S) with V = {S,E}, T ={0,1} and P is defined by transition function as follows:

S -> 0S1/A

A -> 1A0/S/€

Now check the string whether 001011 is acceptable by this PDA or not.

d) Define Push Down Automata. Discuss with an example. **02** **IT403.1**