Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

USN | | | | | | | | | |

Fifth Semester B.E. Degree Examination
Automata Theory and Computability

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module – 1

Q.1

(a) Define the following terms with examples: Alphabet, Power of an alphabet, String, Concatenation and Languages. — 10

(b) Define DFSM. Design a DFSM to accept each of the following languages: — 10
i) L= {wϵ{0,1}* : w has 001 as a substring}
ii) L={ wϵ{0,1}* : w has even number of a's and even number of b's}

OR

Q.2

(a) Convert the following NDFSM to DFSM. — 10

δ	ϵ	a	b	c
->p	{q,r}	{}	{q}	{r}
q	{}	{p}	{r}	{p,q}
*r	{}	{}	{}	{}

(b) Define distinguishable and indistinguishable states. Minimize the following DFSM. — 10

δ	a	b
->A	B	F
B	G	C
*C	A	C
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

Module – 2

Q.3

(a) Define Regular expression. Write the regular expression for the following languages: — 10
i) Representing for strings of a's and b's having odd length.
ii) To accept strings of a's and b's such that third symbol from the right is a and fourth symbol from the right is b.

(b) Use the fsmtoregexheuristic algorithm to construct a regular expression that describes L(M). — 10

δ	a	b
->*1	2	{}
*2	3	1
3	3	1

OR

Q.4

(a) Show that regular languages are closed under complement and intersection. — 8

(b) State and prove pumping lemma theorem for regular languages. And show that the language L={ww^r; wϵ{0,1}*) is not regular. — 12

Module – 3			
Q.5	**(a)**	Define CFG. Design CFG for the languages i) $L=\{0^{2n}1^{m} \mid n>=0,m>=0\}$ ii) $L=\{0^{i}1^{j}2^{k} \mid i=j \text{ or } j=k\}$	10

	(b)	Define Ambiguity. Consider the grammar E->E+E|E*E|(E)|id. Find the leftmost, rightmost derivations and parse trees for the string id+id*id. And show that this grammar is ambiguous.	10
OR			
Q.6	**(a)**	Define CNF. Convert the following CFG to CNF. S->aACa A->B/a B->C/c C->cC/ϵ	10
	(b)	Define PDA. Design a PDA to accept the following language. L={$a^n b^n$; n>=0}. Draw the transition diagram for the constructed PDA. Show the ID's for the string aaabbb.	10
Module – 4			
Q.7	**(a)**	With a neat diagram, explain variants of Turing Machines	10
	(b)	Explain Language Acceptability and Design of Turing Machines.	8
OR			
Q.8	**(a)**	Define a Turing machine. Explain the working of a Turing machine.	8
	(b)	Design a Turing machine to accept L={$0^n 1^n 2^n$| n>=0}. Draw the transition diagram. Show the moves made for string aabbcc.	12
Module – 5			
Q.9	**(a)**	Explain post correspondence problem.	7
	(b)	Explain Halting problem in Turing machine.	6
	(c)	Explain recursively enumerable language.	7
OR			
Q.10	**(a)**	Explain Church Turing thesis.	7
	(b)	Explain Quantum computer.	6
	(c)	Explain Growth rate of function.	7

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome				
Question		**Bloom's Taxonomy Level attached**	**Course Outcome**	**Programme Outcome**
Q.1	(a)	L1	1	1,12
	(b)	L1,L3	2	1,2,12
	(c)			
Q.2	(a)	L3	2	1,2,12
	(b)	L1,L3	2	1,2,12
	(c)			
Q.3	(a)	L2	3	1,2,3,4,12
	(b)	L3	3	1,2,3,4,12
	(c)			
Q.4	(a)	L2	3	1,2,3,4,12
	(b)	L2,L3	3	1,2,3,4,12
	(c)			
Q.5	(a)	L1,L3	3	1,2,3,4,12
	(b)	L2	3	1,2,3,4,12
	(c)			
Q.6	(a)	L1,L3	4	1,2,3,4,12
	(b)	L1,L3	3	1,2,3,4,12
	(c)			
Q.7	(a)	L2,L3	3	1,2,3,4,12
	(b)	L2	3	1,2,3,4,12
	(c)			
Q.8	(a)	L2	4	1,2,3,4,12
	(b)	L3	4	1,2,3,4,12
	(c)			
Q.9	(a)	L2	5	1,2,12
	(b)	L2	5	1,2,12
	(c)	L2	5	1,2,12
Q.10	(a)	L2	5	1,2,12
	(b)	L2	5	1,2,12
	(c)	L2	5	1,2,12

Bloom's Taxonomy Levels	**Lower order thinking skills**		
	Remembering(knowledge): L_1	Understanding Comprehension): L_2	Applying (Application): L_3
	Higher order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6