PG – 668

I Semester M.C.A. (Two Years Course) Examination, May/June 2026
(CBCS Scheme) (2020-2021 and Onwards)
COMPUTER SCIENCE
1MCA4 : Theory of Computation

Time : 3 Hours Max. Marks : 70

Instructions : 1) *Answer **any five** questions from Section – **A**.*
2) *Answer **any four** questions from Section – **B**.*

SECTION – A

Answer **any five** of the following. **Each** question carries **six** marks. **(5x6=30)**

1. What is Finite Automata ? Explain its applications.
2. Draw a DFA to accept language L = {W : |w| mod 5 ≠ 0}.
3. Explain Thompson's construction method for converting a Regular Expression into an equivalent Finite Automaton.
4. What is ambiguous grammar ? Is the following grammar ambiguous ?
   S –> aSbS
   S –> bSaS
   S –> ε On string "aababb".
5. Convert the given Moore machine to its equivalent Mealy machine.

CS	NS		λ
	0	1	
→ q_0	q_3	q_1	a
q_1	q_1	q_2	b
q_2	q_2	q_3	c
q_3	q_3	q_0	d

6. Prove that union of any two recursively enumerable language is also recursively enumerable language.
7. Explain Halting problem with suitable example.
8. Define Post Correspondence problem. Find whether the lists M = (abb, aa, aaa) and N = (bba, aaa, aa) have a Post Correspondence Solution.

P.T.O.

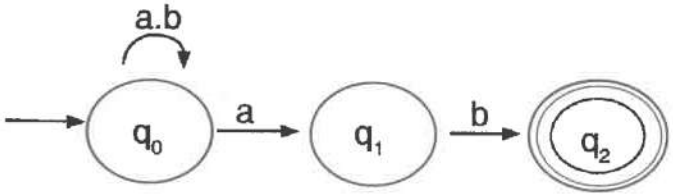
SECTION – B

Answer **any four** of the following. **Each** question carries **ten** marks. **(4×10=40)**

9. Obtain the distinguishable table for the automaton and then minimize the states of following DFA.

δ	0	1
–>A	B	F
B	G	C
*C	A	C
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

10. Convert the following NFA to its equivalent DFA.



11. a) Convert the following grammar to CNF **6**

S–> 0A|1B

A–> 0AA|1S|1

B–> 1BB|0S|0

b) Write a short note on components of PDA. **4**

12. Obtain a Turing Machine to accept the language $L = \{0^n, 1^n | n \geq 1\}$ with transition table and transition diagram.

13. Let language $L = \{a^n b^n | n \geq 1\}$. **(6+2+2)**

a) Obtain a Push Down Automata (PDA) for the given language.

b) Write the sequence of moves by PDA to accept the string aaabbb.

c) Is PDA corresponding to language deterministic ? Justify your answer.

14. Write a short note on the following : **(4+3+3)**

a) Universal languages

b) Rice Theorem

c) Derivation Tree.