School of Engineering
Second Theory Sessional Examination
Odd Semester (AS: 2024-25)

B. Tech: CSE/CSE-AI/CSE-IOTBC/CSE-CCML [Year: III] [Semester: V]

Course Title: AUTOMATA THEORY AND FORMAL LANGUAGES

Course Code: BCS-3504

Max Marks: 30

Time: 1hrs

Instructions if any: Read the question Carefully.

SECTION 'A'

Q.N.1. Attempt all parts of the following:	Course Objective	Marks
a) Define Ambiguous Grammar.	CO3	1
b) "Every Regular Grammar is Context Free Grammar" justify your Answer.	CO3	1
c) State the pumping lemma theorem for regular languages.	CO3	1
d) Define the closure properties of context free languages.	CO4	1
e) Define Turing Machine.	CO4	1

SECTION 'B'

Q.N.2. Attempt any two parts of the following:	Course Objective	Marks
a) Define PDA. Obtain PDA to accept the languages $L=\{a^n b^n \mid n>=1\}$ by a final state.	CO4	7.5
b) Eliminate useless symbols from the grammar. $S \rightarrow AB/CA$, $B \rightarrow BC/AB$, $A \rightarrow a$, $C \rightarrow Ab/b$	CO4	7.5
c) Explain in detail about Chomsky hierarchy of languages.	CO5	7.5

SECTION 'C'

Q.N.3. Attempt any one part of the following:	Course Objective	Marks
a) Prove that Every context free grammar, there is an equivalent grammar G_2 in Chomsky normal form for the given grammar G is $S \rightarrow aAbB$, $A \rightarrow aA/a$, $B \rightarrow bB/b$.	CO5	10
b) Prove that "if L is a Context Free language, then we can construct a pda A accepting L by empty store L=N(A) for the following grammar: $S \rightarrow 0BB$, $B \rightarrow 0S/1S/0$. Test whether 010^4 is in N(A).	CO4	10
c) Explain in detail about variations of the Turing Machine? And construct a Turing machine that recognizes the language $\{a^n b^n c^n \mid n>=1\}$	CO5	10

Table 1: Mapping between COs and questions
(Number of COs may vary from course to course)

COs	Questions Numbers	Total Marks
CO3	1.a, 1.b, 1.c	3
CO4	1.d, 1.e, 2.a, 2.b, 3. b	27
CO5	2.c, 3.a, 3.c	27.5