PVP 19

Code: 19CS3502 / 19IT3502

III B.Tech - I Semester – Regular Examinations – JANUARY 2022

FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE & IT)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) Write about the applications of Finite Automata?
   b) Define a Regular Expression.
   c) Define Context Free Grammar.
   d) Define Push Down Automata.
   e) Describe Universal Turing Machine.

PART – B

UNIT – I

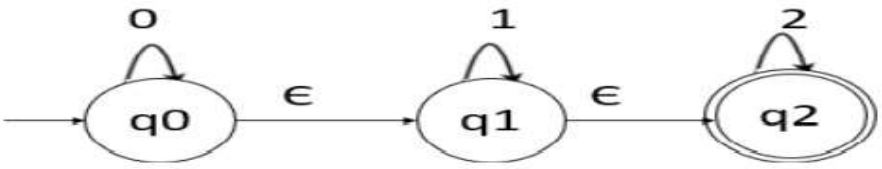
2. a) Construct DFA which accepts Regular language of all the strings having even no of a's and b's. 6 M
   b) Construct a DFA equivalent to NFA whose transition table is given below: 6 M

State	a	b
->q_0	q_0,q_1	q_2
q_1	q_0	q_1
(final state)q_2	-	q_0,q_1

OR

3. a) Construct DFA that accepts the strings which are divisible by 3 over the alphabet {0, 1}. 6 M

b) Design NFA without epsilon from the given NFA with epsilon 6 M



UNIT – II

4. a) Show that the following language is regular or not by using pumping lemma $L=\{a^n b^n \mid n=0,1,2,3,...\}$ 6 M

b) Explain algebraic laws for regular expressions. 6 M

OR

5. a) Construct a ε -NFA for the Regular expression (0+1)* (00+11) (0+1)* 6 M

b) Explain the closure properties of Regular languages. 6 M

UNIT-III

6. a) Convert the following CFG into CNF 6 M

$S \rightarrow XY \mid Xn \mid p$

$X \rightarrow mX \mid m$

$Y \rightarrow Xn \mid o$

b) Describe the step-wise process to convert a CFG into Greibach Normal Form (GNF). 6 M

OR

7. a) Consider the grammar 6 M

S->aB|bA

A->aS|bAA|a

B->bS|aBB|b

For the string "aaabbabbba" construct:

i) The leftmost derivation and leftmost derivation tree.

ii) The rightmost derivation and rightmost derivation tree.

b) Explain the properties of Context-free languages. 6 M

UNIT – IV

8. a) Construct a PDA for the following grammar 6 M

$S \rightarrow AA/a$, $A \rightarrow SA/b$

b) Explain the basic structure of PDA with a suitable example. 6 M

OR

9. a) Construct the CFG for the PDA, M = ($\{q_0,q_1\}$, {0,1}, $\{R,Z_0\}$, δ, q_0, Z_0, Φ) and δ is given by 6 M

$\delta(q_0,1,Z_0)=(q_0,RZ_0)$

$\delta(q_0,1,R)=(q_0,RR)$

$\delta(q_0,0,R)=(q_1,R)$

$\delta(q_1,0, Z_0)=(q_0, Z_0)$

$\delta(q_0,\varepsilon, Z_0)=(q_0,\varepsilon)$

$\delta(q_1,1,R)=(q_1,\varepsilon)$

b) Explain the Informal and Formal definitions of Pushdown Automata in detail. 6 M

UNIT – V

10. a) Design a Turing Machine to accept L={WcW^R| W is in (a+b)*}. 6 M

    b) Show that the Halting Problem of a Turing machine is Undecidable. 6 M

OR

11. a) Find whether the lists M = (ab, bab, bbaaa) and N = (a, ba, bab) have a Post Correspondence Solution? 6 M

    b) Explain about the undecidable problems about Turing machines. 6 M