R18

Code No: 155BK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, July/August - 2023

FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE, IT, ECM, ITE, CSE(CS))

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define the terms: Transition diagram and Transition Table.	[2]
b)	Define Moore Machine.	[3]
c)	What are the closure properties of Regular Languages?	[2]
d)	Explain how to convert a regular expression to finite automata.	[3]
e)	Define ambiguity in Grammars.	[2]
f)	Compare Leftmost and Rightmost Derivation.	[3]
g)	What are decision properties of Context Free Languages?	[2]
h)	What do you mean by restricted TM?	[3]
i)	What do you mean by undecidability?	[2]
j)	What is class NP-complete problem?	[3]

PART – B

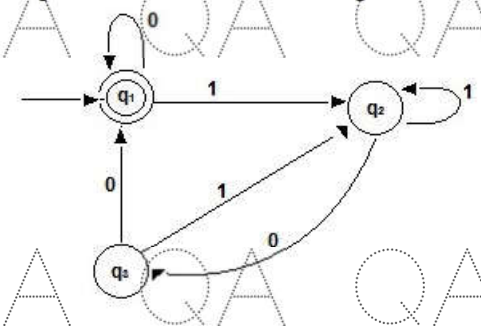
(50 Marks)

2.a) Design FA to accept string with ‘a’ and ‘b’ such that the number of a’s are divisible by 3.
b) Design FA that accept set of all string with three consecutive 0’s over Σ={0,1}. [5+5]

OR

3. Design Moore Machine for “reseduo mod 4” where input is treated as binary. Convert the Moore machine to Melay machine. [10]

4.a) Discuss pumping lemma for regular languages. Prove that the following language $\{a^n b^n \mid n \geq 1\}$ is not a regular?
b) Construct the regular expression for the following finite automata. [5+5]



OR

5. Minimize the following FA. [10]

	0	1
→A	B	A
B	A	C
C	D	B
(D)	D	A
E	D	F
F	G	E
G	F	G
H	G	D

6.a) Discuss parse trees and construction of parse tree with examples.

b) Construct PDA from the following CFG.

$S \rightarrow ABA \mid AB \mid BA \mid A \mid B$

$A \rightarrow aA \mid a\ B \rightarrow bB \mid b$ [5+5]

OR

7. Construct the CFG where M=($\{q_0,q_1\}$, {0,1}, {R,Z_0}, δ, q_0, Z_0, Φ) and δ is given by

$\delta(q_0,0,Z_0)=(q_0,RZ_0)$

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

$\delta(q_0,1,R)=(q_1,\varepsilon)$

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

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

$\delta(q_1,\varepsilon,Z0)=(q_1,\varepsilon)$ [10]

8.a) Find a GNF equivalent to the following grammar G=({S,A,B},{a,b},P,S) where P consists of the following

S→AB

A→BS/b

B→SΛ/a

b) Construct CFG without ε – production from the one which is given below: [5+5]

S → a | Ab | aBa

A → b | ε

B → b | A

OR

9.a) Prove that L={ WW | w is a binary string} is not a CFL.

b) Construct CNF for the following CFG. [5+5]

S→ABA

A→aA|Є

B→bB|Є

10. Design a TM to recognize the language L= { $1^n2^n3^n \mid n\geq 1$ }. [10]

OR

11.a) Explain briefly modified post correspondence problem.

b) Prove that the PCP with two lists a={01,1,1}, b={111,10,11} has no solution. [5+5]

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