R18

Code No: 155BK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, March - 2024

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 Moore machine.	[2]
b)	Define NFA. What are the differences between DFA and NFA?	[3]
c)	List out the applications of Regular expression.	[2]
d)	What are the Closure properties of Regular languages with examples?	[3]
e)	Define Push Down Automata.	[2]
f)	What is ambiguous grammar with an example?	[3]
g)	Specify the reason for eliminating useless symbols. How to identify them?	[2]
h)	State the Statement of pumping lemma for Context-Free Languages.	[3]
i)	When do you say that a Turing Machine accepts a string?	[2]
j)	Give an Example of a Recursive enumerable language.	[3]

PART – B

(50 Marks)

2.a) Design e DFA that accepts any string with *aababb* as a substring over ∑ = {a, b}.
b) Convert the following NFA to DFA (figure 1). [5+5]

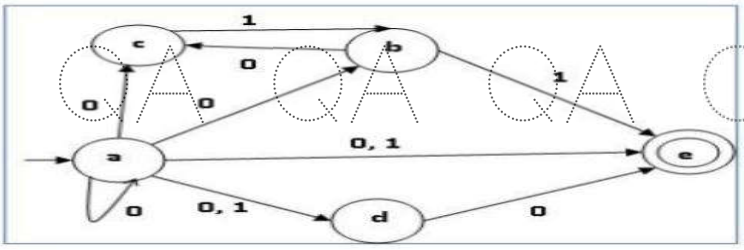

Figure 1

OR

3.a) Convert the following NFA with ε moves to DFA without ε moves (figure 2).

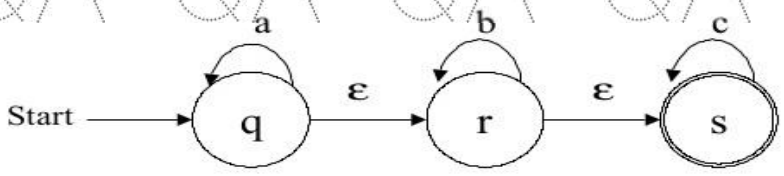

Figure 2

b) Convert the following Mealy machine into its equivalent Moore machine. [5+5]

Present State	I/P=0		I/P=1	
	Next State	O/P	Next State	O/P
→ A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

4.a) What is regular expression? Write the regular expression for the following languages over $\sum = \{0, 1\}^*$

i) The set of all strings such that number of 0's is odd

ii) The set of all strings that contain exactly three 1's

iii) The set of all strings that do not contain 1101.

b) Explain about Arden's theorem, for constructing the RE from a FA with an example (figure 3). [5+5]

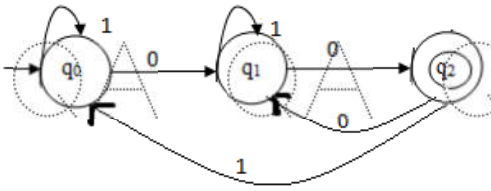

Figure 3

OR

5.a) State and prove pumping lemma for regular languages.

b) Write the process to identify the equivalence of two FA's? Find whether the two FA's are equivalent or not (figure 4(a) and 4(b)). [5+5]

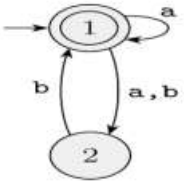

Figure 4(a)

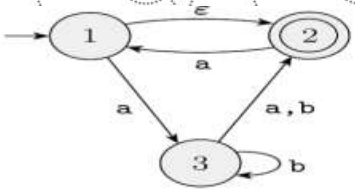

Figure 4(b)

6.a) Explain about derivation and parse trees? Construct the string 11001010 from the Leftmost and Rightmost derivation

S→1B/0A

A→1/1S/0AA

B→0/0S/1BB

b) Explain about the applications of Context-Free Grammars. [5+5]

OR

7.a) Construct a PDA which accepts language of word over alphabet {a,b,c } contain

$\{a^i b^j c^k / i,j,k \in N, i+k=j\}$.

b) Construct the PDA that accepts the language generated by given grammar. [5+5]

S→aABBlaAA, A→aBBla, B→bBBlA

8.a) Simplify the following context free grammar.

$S \rightarrow TU|V$
$T \rightarrow aTb|\varepsilon$
$U \rightarrow cU|\varepsilon$
$V \rightarrow aVc|W$
$W \rightarrow bW|\varepsilon$

b) Convert the following grammar into CNF: [5+5]

$S \rightarrow bA/aB \quad A \rightarrow bAA/aS/a \quad B \rightarrow aBB/bS/a.$

OR

9.a) Explain about the Closure properties of CFL's.

b) Construct a Turing machine that recognizes the language $L=\{a^n b^n c^n , n>1\}$. [5+5]

10.a) Why a Turing machine is called Linear Bounded Automata? Discuss the advantages of Linear Bounded Automata.

b) Explain the design of universal Turing machine with its halting problem. [5+5]

OR

11.a) Explain about the Decidability and Undecidability Problems.

b) Find whether post correspondence problem P={(10,101),(011,11),(101,011)} has match? Give the solution. [5+5]

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