Code No.: CS504PC   R20   H.T.No. | | | 8 | R | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Regular) - January- 2024
FORMAL LANGUAGES AND AUTOMATA THEORY
(Common for CSE, IT, CSC, CSM)

[Time: 3 Hours]   [Max. Marks: 70]

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks.

PART-A   (20 Marks)

1. a) Define the formal definition of Finite Automata.   [2M]
   b) Define Mealy Machine.   [2M]
   c) State pumping lemma for regular expression.   [2M]
   d) List the decision properties of regular languages.   [2M]
   e) For the given grammar {S→AS/a, A→SbA/SS/ba} Construct left most derivation tree   [2M]
      for the string "aabbaaa"

   f) What is an ambiguity?   [2M]
   g) What is Chomsky Normal Form?   [2M]
   h) List out the Closure properties of CFL.   [2M]
   i) List out the types of TM.   [2M]
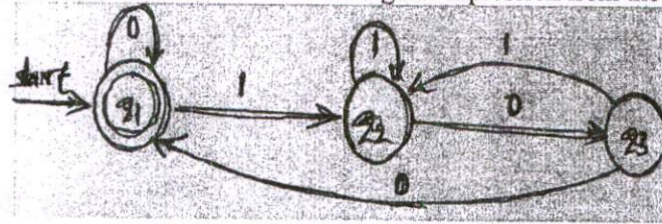   j) Define Undecidability?   [2M]

PART-B   (50 Marks)

2. Define ∈-NFA. Convert the given ∈-NFA to NFA   [10M]
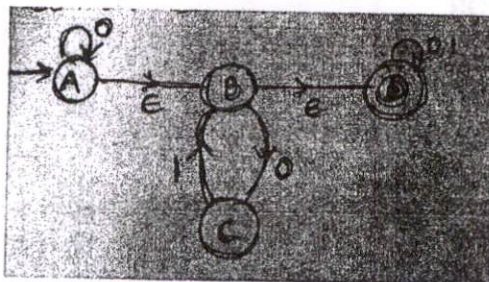
OR

3. Define Moore Machine. Construct a moore machine that takes set of all strings over {a, b}   [10M]
   as input and prints"1"as output for every occurance of "a, b" as a substring.

4. State and prove Arden's theorem. Find out the regular expression from the given FA [10M]

OR

5. Explain the procedure of equivalence between Finite Automata & find out whether the [10M] given FA are equivalent or not.

Finite automata 'A

State/Σ	c	d
$\rightarrow Q_{1*}$	Q_1	Q_2
Q_2	Q_3	Q_1
Q_3	Q_2	Q_3

Finite automata 'B'

State/Σ	c	d
$\rightarrow Q_{4*}$	Q_4	Q_5
Q_5	Q_6	Q_4
Q_6	Q_7	Q_6
Q_7	Q_6	Q_4

6. Construct Leftmost Derivation. , Rightmost Derivation, Derivation Tree for the following [10M] grammar with respect to the string aaabbabbba.

$$S \rightarrow aB \mid bA$$
$$A \rightarrow aS \mid bAA \mid a$$
$$B \rightarrow bS \mid aBB \mid b$$

OR

7. Construct CFG from PDA [10M]

$A = (\{q0,q1\},\{a,b\},\{Z0,Z\},\delta,q0,Z0,\emptyset)$

Where δ : $\delta(q0,b, Z0) = (q0, ZZ0)$

$\delta(q0,b, Z) = (q0, ZZ)$

$\delta(q1,b, Z) = (q1, \epsilon)$

$\delta(q0, \epsilon, Z0) = (q0, \epsilon)$

$\delta(q0,a, Z) = (q0, Z)$

$\delta(q1,a, Z0) = (q0, Z0)$

8. Define Griebech Normal Form. Change the following CFG into GNF. [10M]
$S \rightarrow AA/a$, $A \rightarrow SS/b$

OR

9. Design a Turing machine for unary multiplication. [10M]

10.a) Explain types of Turing machine. [5M]
  b) What is Post Correspondence Problem? Verify whether the following PCP has a solution [5M] or not? A={ba,ab,a,baa,b},B={bab, baa, ba,a,aba}

OR

11.a) Explain about recursively enumerable language. [5M]
  b) Define and explain Decidable and undecidable problem for turing machine. [5M]

****