

Total No. of Questions : 12]

SEAT No. :

P2284

[4758] - 103

[Total No. of Pages :4

T.E. (I.T.)

THEORY OF COMPUTATION

(2008 Course) (Semester - I) (314442)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*

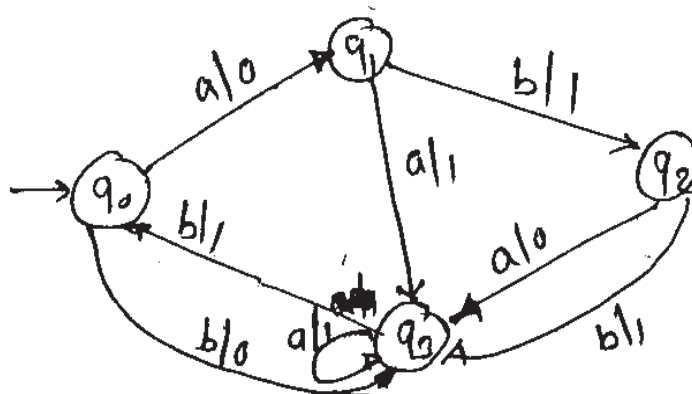
SECTION - I

Q1) a) Design FA that rear strings made up of letters in the word CHARIOT and accept those string that contain 'CAT' as a substring. [9]

b) Find Mealy and Moore m/c for following: For I/P $\Sigma = \{0,1,2\}$, print the residue modulo 5 of the i/p treated as a ternary no. [9]

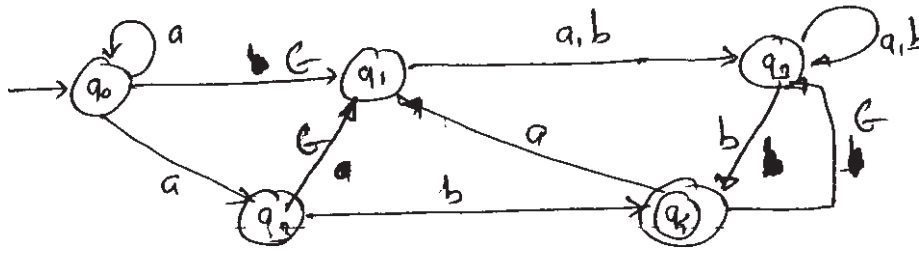
OR

Q2) a) Design Moore m/c from given mealy m/c [9]



P.T.O.

- b) Convert given NFA- ϵ to its equivalents DFA. [9]



- Q3) a) Write RE for the following [8]

- $\Sigma = \{a,b\}$, Set of all strings that have at least one a & at least one b.
- $\Sigma = \{0,1\}$, Set of all strings in which every 0 followed by immediately 11.
- $\Sigma = \{0,1\}$, Set of Strings begin or end with 00 or 11
- $\Sigma = \{a,b\}$, Set of strings, such that all the string do not have substring 'ab'.

- b) Describe English language for following RE: [8]

$$(1+01+001)^* \cdot (\epsilon+0+00)$$

OR

- Q4) a) Give RE and FA for [7]

$$L = L_1 \cap L_2 \quad \Sigma = \{0,1\}$$

Where L_1 = All the string of even length

L_2 = All the starting with b

- b) Give the limitation of FA and Application of RE, FA. [3]

- c) Find DFA from given RE $(1.1+0)^* \cdot 1^*$. [6]

- Q5) a) Application of CFG: Explain the detail with an example [4]

b) Give CFG for following languages [12]

i) All strings with at least two a's on them

ii) Matching parenthesis $\Sigma = \{(,)\}$

iii) All string without substring 'aaa' $\Sigma = \{a,b\}$.

iv) $R = bba * bb + bb$

OR

Q6) a) Test whether the following grammars is ambiguous or not, if it is ambiguous then remove ambiguity [8]

$S \rightarrow Ab, A \rightarrow a, B \rightarrow C|b, C \rightarrow D, D \rightarrow E, E \rightarrow a.$

b) Find CNF for the given grammar: [8]

$S \rightarrow ABAB$

$A \rightarrow aA | \epsilon$

$B \rightarrow bA | \epsilon$

SECTION - II

Q7) a) Convert following right linear grammar to left linear grammar stepwise [8]

$S \rightarrow 0A | 1B$

$A \rightarrow 0C | 1A | 0$

$B \rightarrow 1B | 1A | 1$

$C \rightarrow 0 | 0A$

b) Show that the context free languages are closed under union, concatenation and kleen closure operations. [8]

OR

Q8) a) Convert following Regular expression to Regular Grammar [8]

$(ab + a)^* (aa + b)$

- b) Is the language $L = \{a^n b^m \mid n \neq m\}$ context free? If yes write CFG defining the above language. If no, prove it. [8]

Q9) a) Construct PDA for accepting language of following CFG: [9]

$$S \rightarrow bA \mid aB,$$

$$A \rightarrow bAA \mid aS \mid a,$$

$$B \rightarrow aBB \mid bS \mid b$$

- b) Design a PDA accepting by empty store/stack of the following language:
 $L = \{a^m b^m c^n \mid m, n \geq 1\}$ [9]

OR

Q10) a) Construct a CFG for following PDA: [10]

$$M = \{[q_0, q_1], [a, b], [Z_0, Z], \partial, q_0, Z_0, \theta\} \quad \partial \text{ is given by}$$

$$\partial(q_0, b, Z_0) = \{(q_0, Z, Z_0) \quad \partial(q_0, \epsilon, Z_0) = \{(q_0, \epsilon)\}$$

$$\partial(q_0, b, Z) = \{(q_0, ZZ)\} \quad \partial(q_0, a, Z_0) = \{(q_1, Z)\}$$

$$\partial(q_1, b, Z) = \{(q_1, \epsilon)\} \quad \partial(q_1, a, Z_0) = \{(q_0, Z_0)\}$$

- b) Design a PDA accepting by empty store/stack of the following language:
 $L = \{a^n b^{2n} \mid n \geq 1\}.$ [8]

Q11) a) Construct TM to that can compute proper subtraction, i.e. $m - n$, where m and n are positive integers $m - n$ is defined as $m - n$ if $m > n$ and 0 if $m \leq n$. [8]

- b) Explain in detail Halting problem of Turing m/c. [8]

OR

Q12) a) Design a TM for to copy the string, $\Sigma = \{a, b\}$. [8]

- b) Give the short note on following: [8]

i) UTM

ii) Application and limitation of TM.

