Total No. of Questions : 12]

SEAT No. : ____

P2284

[Total No. of Pages :4

[4758] - 103
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.***

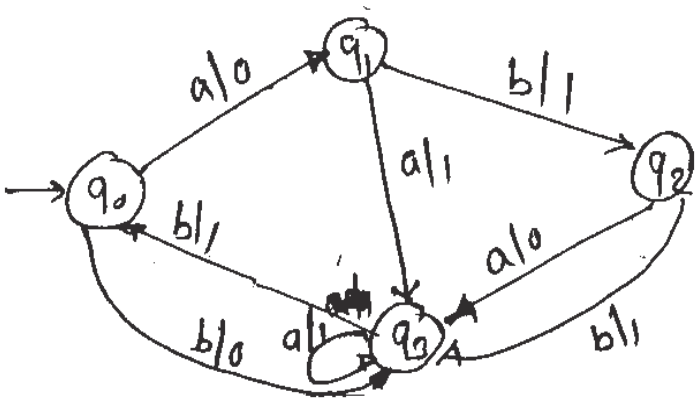
SECTION - I

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 $\sum = \{0,1,2\}$, print the residue modulo 5 of the i/p treated as a ternary no. **[9]**

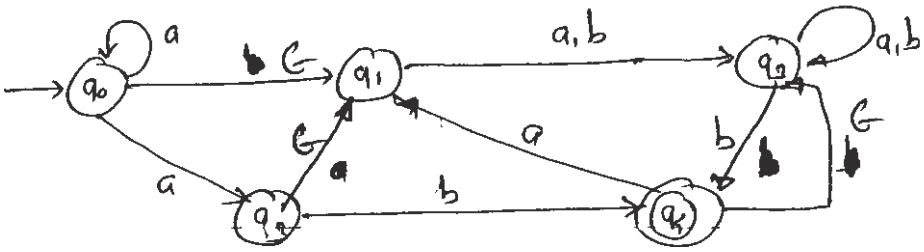
OR

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



P.T.O.

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



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

i) ∑ = {a,b}, Set of all strings that have at least one a & at least one b.

ii) ∑ = {0,1}, Set of all strings in which every 0 followed by immediately 11.

iii) ∑ = {0,1}, Set of Strings begin or end with 00 or 11

iv) ∑ = {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)* . (∈ +0+00)

OR

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

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

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)*. 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]**

$S \rightarrow ABAB$

$A \rightarrow aA|\in$

$B \rightarrow bA|\in$

SECTION - II

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

$S \rightarrow 0A|1B$

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

$B \rightarrow 1B \mid 1A \mid 1$

$C \rightarrow 0|0A$

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: $L = \{a^m b^m c^n \mid m, n >= 1\}$ **[9]**

OR

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

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

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

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

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

b) Design a PDA accepting by empty store/stack of the following language:

$L = \{a^n b^{2n} \mid n >= 1\}$. **[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 <= n. **[8]**

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

OR

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

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

i) UTM

ii) Application and limitation of TM.

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