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Total No. of Questions : 6]

SEAT No. :

P5092

[Total No. of Pages :3

TE/Insem.-641
T.E. (IT) (Semester-I)
THEORY OF COMPUTATION
(2015 Pattern)

Time : 1 Hour]

[Maximum Marks : 30

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Attempt questions Q.1 or Q.2 Q.3 or Q.4 Q.5 or Q.6.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

Q1) a) Construct FA for the following Language L **[8]**

$$L = \left\{ \begin{array}{l} W | W \text{ is a binary word of length } 4i, i \geq 1 \text{ such that each consecutive} \\ \text{Block 4 bits contains at least 2 0's} \end{array} \right\}$$

b) Distinguish between NFA & DFA **[2]**

OR

Q2) a) Construct Mealy machine for the following Language **[6]**

$$L = \left\{ \begin{array}{l} \text{for input from } \Sigma^* \text{ where } \Sigma = \{0, 1\} \\ \text{if the input ends in 101 output is x,} \\ \text{if the input ends in 110 output is y,} \\ \text{otherwise output z} \end{array} \right\}$$

b) Define **[4]**

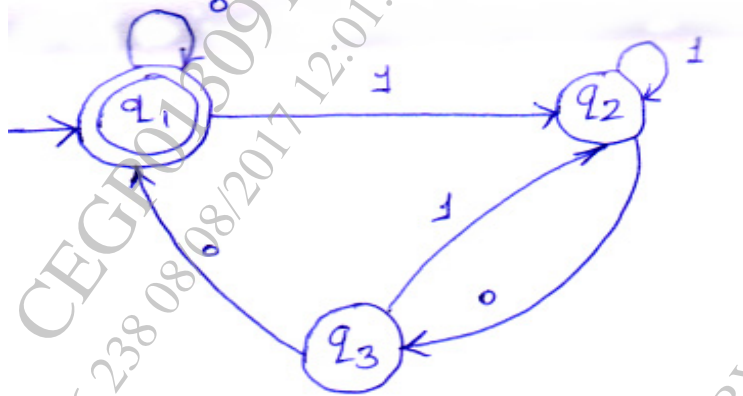
- i) Alphabet
- ii) String
- iii) Language
- iv) Formal Language

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Q3) a) Using identity Laws prove that [4]

$$(1+011)^* = \epsilon + 1^* (011)^* (1^*(011)^*)^*$$

b) Construct regular expression for the following FA using Arden's Theorem [6]



OR

Q4) a) Write regular expression for [4]

- Strings consisting of a's and b's without any combination of double letters over $\Sigma = \{a, b\}$
- Strings that either contain all b's or else, there is an 'a' followed by some b's; the set also contain ϵ over $\Sigma = \{a, b\}$

b) Construct DFA for following r.e. [6]

$$r = (1(00)^* 1 + 010^*)^* \text{ using direct method}$$

Q5) a) Consider the following CFG: [4]

$$G = \{(S, A), (a, b), P, S\}$$

Where P consists of :

$$S \rightarrow aAs | a$$

$$A \rightarrow SbA | ss | ba$$

Derive string 'aabbba' using leftmost & right most derivation

- b) Convert given CFG into GNF [6]

$$S \rightarrow Bs|Aa$$

$$A \rightarrow Bc$$

$$B \rightarrow Ac \text{ where,}$$

$$V = \{S, A, B\} \text{ \& } T = \{a, c\}$$

OR

- Q6) a) Eliminate the ϵ - productions from the Grammar G which is defined as: [6]

$$S \rightarrow ABA$$

$$A \rightarrow aA|\epsilon$$

$$B \rightarrow bB|\epsilon$$

- b) Write CFG for the following Languages [4]

i) $L = \{a^j b^j c^k / i, j + k\}$

ii) $L = \{a^{2n} bc / n \geq 1\}$

