ASSIGNMENT QUESTIONS

Subject: Theory of Computation (2160704)

Q 1

- Define the Strong Principle of Mathematical Induction. Prove the following using mathematical Induction.

$$7+ 13 + 19 + \ldots\ldots + (6n+1) = n (3n+4)$$

- Using Principle of Mathematical Induction, prove that for every n >= 1,

$$\sum_{i=0}^{n} i = 1+2+3+\ldots..+n = n (n+1) / 2$$

- Show that $2^n > n^3$ for n >10 by Mathematical Induction.

Q-2

1. Find regular expression for the following:
2. Language of all string that do not end with 01.
3. Strings with odd numbers of 1's (Ones).
4. Strings that start with 1 and do not end with 10.
5. The language of all strings that do not contain the substring 110.
6. The language of all strings in which both the number of 0's and the number of l's are odd.
7. Strings that contains odd number of 0's (zeroes).
8. Strings that begin or end with 00 or 11.

Q-3

(i)

Draw Finite Automata (FA) for following languages:

L_1 = {x / 11 is not a substring of x, x ∈ {0,1}*}

L_2 = {x / x ends with 10, x ∈ {0,1}* }

Find L1∩ L2 & L1-L2

(ii) Draw FA For accepting:

(i) The string in {0,1}* ending in 1 and not containing substring 00.

(ii) The strings with odd no. of 1's and odd no. of 0's

(iii)

Draw FA for each of the following RE.

i. (0+1)*(1+00)(0+1)*

ii. (0+1)*(01+110) iii. (111+100)*0

Q-4

(i)

Convert following NFA- Λ to NFA and FA.

Q	δ(q, Λ)	δ(q, 0)	δ(q, 1)
A	{B,D}	{A}	Ø
B	Ø	{C}	{E}
C	Ø	Ø	{B}
D	Ø	{E}	{D}
E	Ø	Ø	Ø

(ii) Convert following NFA-^ to NFA and FA

q	δ (q, Λ)	δ(q, 0)	δ(q, 1)
A	{B}	{A}	Ø
B	{D}	{C}	Ø
C	Ø	Ø	{B}
D	Ø	{D}	Ø

Q-5

- Define CFG and Regular grammar.
- Define NFA – Λ
- Define regular language and regular expressions.
- Define Pumping Lemma.
- Application of Regular expression and limitation of FA.

Q-6

- Compare FA,NFA ,NFA-^ with illustration.
- Compare mealy and moore machine.

Q-7

- For the following Regular Expression draw an NFA- Λ recognizing the corresponding languages.
  (i) $(00 + 1)^* (10)^*$
  (ii) 001^*0^*11
- Draw an NFA-Λ recognizing the corresponding language.
  $(0 + 1)^* (10+01)^* 11$

Q-8

- Design a CFG(Context Free Grammar) for the following language.
  $L = \{ 0^i1^j0^k \ / \ j > i+k \}$
- Construct CFG which consist of all the strings having at least one occurrence of 000.
- Generate the Context-Free Grammars that give the following languages.
  (i) $\{w \mid w$ contains at least three 1s$\}$
  (ii) $\{w \mid w$ starts and ends with the same symbol$\}$

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