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SF-8329

B. E. - III (Sem. - VI) Examination

May/June – 2011

Theory of Computation

Time : 3 Hours] [Total Marks : 100

Instruction :

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 3 (SEM. - 6)

Name of the Subject :

☛ THEORY OF COMPUTATION

☛ Subject Code No. : 8 3 2 9 ☛ Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

1 [A] Do as directed. **[10]**

(1) Define one-to-one and on-to function. **[02]**

(2) Give recursive definition for set of all strings in {0,1}* containing substring 00 . **[04]**

(3) Explain the logical quantifiers and quantified statement. **[02]**

(4) Define FA. **[02]**

1[B] Give the regular expression for the following set of languages over set {0,1}. **[04]**

(i) The language of all strings containing substring 110.

(ii) The language of all strings containing exactly two 0's.

2 Do as directed.

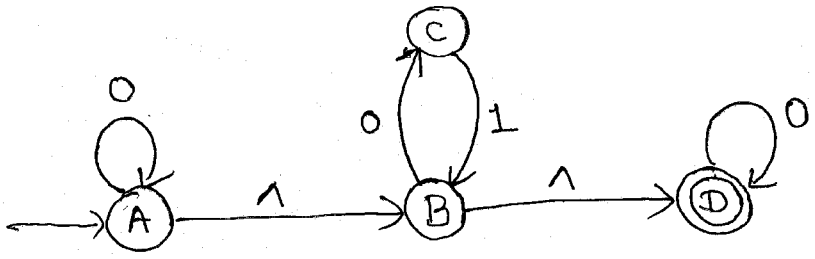
(1) Draw an FA to recognize the following languages defined over {0,1}*. (Any two)- **[08]**

(i) 0 +10* + 01*0

(ii) (111 + 100)* 0

(iii) {w | w has two or three 1's }

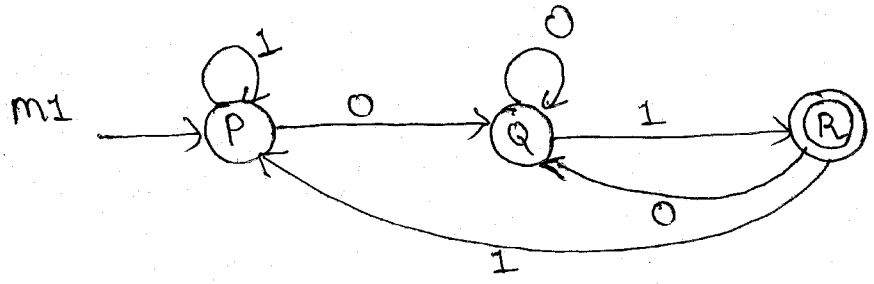
(2) Find equivalent NFA and FA for NFA – Λ given below. **[08]**

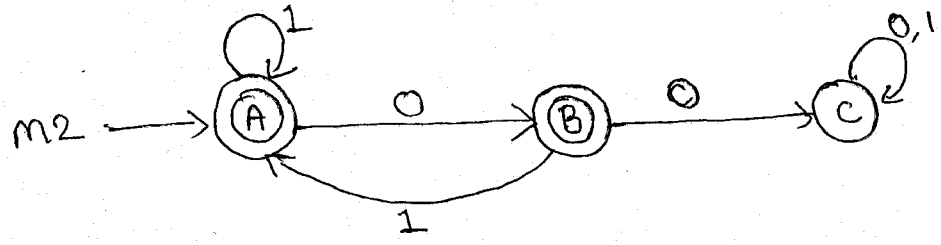


OR

(2) Let M1 and M2 be the FA shown in figures, recognizing language L1 and L2 respectively. Draw an FA recognizing following languages. [08]

(i) L1 U L2
(ii) L1 ∩ L2
(iii)L1 – L2





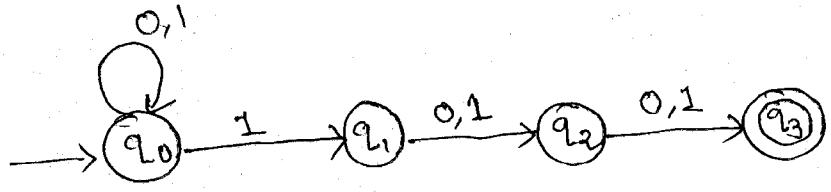
3 Do as directed.(Any four) [20]

(1) Define NFA - Λ and extended transition function δ * for NFA - Λ .

(2) Using pumping lemma prove that the language $L = \{0^i 1^j 0^k \mid k > i+j\}$ is not regular.

(3) Draw an NFA- Λ recognizing the language ((ab)* b + ab*)*.

(4) Calculate $\delta^*(q_0, 01)$, $\delta^*(q_0, 011)$ for NFA given below.



(5) Describe P , NP and NP complete problem..

4 [A] Do as Directed [10]

(1) Define Semi word

(2) Define Context Free Grammar (CFG)

(3) The language EVENPALINDROME is a regular language (TRUE/FALSE)

(4) PDA maintains a tape for storage.(TRUE/FALSE)

(5) The intersection of two context free language is always context free (TRUE/FALSE)

(6) The class of automata that can be associated with context free languages is _____.

(7) A CFG **G** is said to be _____ if there exists a string w in L(G), for which more than one parse trees can be generated.

(8) Recursively Enumerable languages are accepted by _____.
(9) Turing machine uses _____ as storage device.
(10) The set of $\{a^n b^{2n} \mid n = 1,2,\ldots\}$ can be generated by the CFG _____.

[B] Define **Chomsky Normal Form (CNF).** [10]
Convert the following CFG to CNF
(i) **E→E+E | E*E|(E)| 9**
(ii) **S →SaS | SaSbS | SbSaS | ^**

5 [A] Find **CFG** for the following languages [8]
(i) $\{ a^i b^j c^k \mid i,j,k = 1,2,3,\ldots$ And $i \neq j$ or $j \neq k \}$
(ii) $\{ a^i b^j c^k \mid i,j,k = 1,2,3,\ldots$ And $j = 2i + 2k \}$
[B] Build **Turing Machine** to compute 1's complement. [8]

OR

[A] Give the **CFG** for the language $\mathbf{a^n b^n}$. Convert the CFG to CNF. Make PDA that accepts the language. [8]
[B] Build **Turing Machine** for subprogram **DELETE**. [8]
6 [A] Attempt **Any one.** [6]
(1) Design a Turing Machine to recognize the string of the type $(01)^n$.
(2) For the following CFG's describe the language it accepts:
(a) **S → SS | XaXaX | ^**
X → bX | ^
(b) **S → aS | bS | a | b | ^**
(c) **S → aM | bS**
M → aF | bS
F → aF | bF | ^
[B] Attempt **Any Two.** [8]
(1) Prove that "The Context Free Languages are closed under union."
(2) Killing the Unit Productions
S → A | bb
A → B | b
B → S | a
(3) Design the CFG for following
Regular Expression =01(1100)*110(10)*,
Set of NonTerminals = {S,A,B}, $\sum$={0,1}