SE-sem-IV- CBGS- computers

(22)

TCS

17/12/15

5485

Q.P. Code :

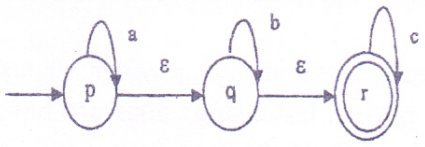
(3 Hours) **[Total Marks : 100**

N.B. : (1) Question Number **1** is compulsory.
(2) Attempt any **three** questions out of remaining **five** questions.
(3) **Assumptions** made should be **clearly** stated.
(4) **Figures** to the **right** indicate **full** marks.
(5) Assume suitable **data** whenever **required** but **justify** the same.

1. (a) Consider the following grammar G = (V, T, P, S), V = {S, X}, T {0, 1 } and productions P are **5**
$S \rightarrow 0 \mid 0X1 \mid 01S1$
$X \rightarrow 0XX1 \mid 1S$
S is start symbol. Show that above grammar is ambiguous.

(b) State and prove the halting problem. **5**

(c) Convert following ε-NFA to NFA without ε. **5**



(d) Prove that Language $L = \{0^n10^n$ for n = 0, 1, 2, ... } is not regular. **5**

2. (a) Consider the following grammar G = (V, T, P, S), V = {S, X, Y}, T {a, b}and productions P are **10**
$S \rightarrow XYX$
$X \rightarrow aX \mid \varepsilon$
$Y \rightarrow bY \mid \varepsilon$
Convert this grammar in Chomsky Normal Form (CNF).

(b) Design DPDA to accept language $L=\{ x \in \{a, b\}^* \mid N_a(x) > N_b(x) \}$, **10**
$N_a(x) > N_b(x)$ means number of a's are greater than number of b's in string x.

3. (a) Design Turing machine to accept the language L = set of strings with equal number of a's and b's. **10**

(b) Design the DFA to accept the language containing all the strings over Σ = {a, b, c} that starts and ends with different symbols. **10**

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4. (a) Design Moore Machine for the input from (0+ 1 +2) * which print the residue modulo 5 of the input treated as ternary number. **10**

   (b) State and prove pumping lemma for context free languages. **10**

5. (a) Convert the following grammar into finite automata. **5**

   $S \rightarrow aX \mid bY \mid a \mid b$

   $X \rightarrow aS \mid bY \mid b$

   $Y \rightarrow aX \mid bS$

   (b) Compare recursive and recursively enumerable languages. **5**

   (c) State and prove Rice's theorem **10**

6. (a) Write regular expression for the following languages. **5**

   (i) language containing all the strings in which every pair of adjacent a's appears before any pair of adjacent b's, over the alphabet $\Sigma = \{a, b\}$.

   (ii) language containing all the strings in which all possible combination of a's and b's is present but strings does not have two consecutive a's , over the alphabet Σ {a, b}.

   (b) Write short note on "Universal Turing Machine". **5**

   (c) Explain variations and equivalences of Turing machine. **10**