SE (SEM IV) (Rev-2012) (CBSGS)
Comp   Dec. 2015

T.C.S.

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   5
　　　　productions P are
　　　　$S \rightarrow 0 \mid 0X1 \mid 01S1$
　　　　$X \rightarrow 0XX1 \mid 1S$
　　　　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
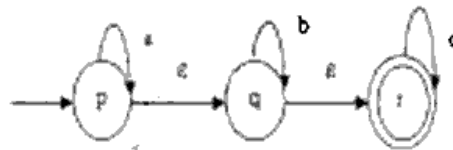
　　(d) Prove that Language $L = \{0^n 10^n$ for $n = 0, 1, 2, \ldots \}$ is not regular.   5

2. (a) Consider the following grammar $G = (V, T, P, S)$, $V = \{S, X, Y\}$, $T \{a, b\}$ and   10
　　　　productions P are
　　　　$S \rightarrow XYX$
　　　　$X \rightarrow aX \mid \varepsilon$
　　　　$Y \rightarrow bY \mid \varepsilon$
　　　　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   10
　　　　number of a's and b's.

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

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MD-Con. 11584-15.