# BACHELOR IN COMPUTER APPLICATIONS 

Term-End Examination<br>December, 2011

## CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 hours
Maximum Marks : 75
Note: Question no. 1 is compulsory. Attempt any three questions from the rest of the question paper.

1. (a) Construct a NDFA that recognizes the 5 following language :
$\mathrm{L}=\left\{x \in\{\mathrm{a}, \mathrm{b}, \mathrm{c}\}^{*}: x\right.$ contains a substring 'acaba' \}
(b) What is a grammar of a language and $\mathbf{1 0}$ mention its one application in computing ? Enumerate different types of grammar under Chomsky Hierarchy with an example.
(c) What are regular languages? Explain with 5 appropriate examples.
(d) Let $\Sigma=\{0,1\}$ and $A$ and $B$ be the list as given below :

| $i$ | List A | List B |
| :---: | :---: | :---: |
|  | $w_{i}$ | $x_{i}$ |
| 1 | 10 | 101 |
| 2 | 011 | 11 |
| 3 | 101 | 011 |

Find the instance of PCP.
(e) Distinguish clearly the NP complete and NP hard problems.
2. (a) Construct a DFA equivalent for the given NFA- $\epsilon$ with the transition diagram as follows :

(b) Show that the set of regular languages is closed under intersection through an example.
3. (a) Construct a PDA for the language $\left\{0^{n} 1^{n} \mid n \geqslant 1\right\}$ and enumerate all the stages of construction.
(b) What is about the universal turing machine?

Cite an example.
4. (a) Design a TM that recognizes a specified string of 0 's and 1's on a tape and prints an ' $E$ ' if the number of 1 's is even and a ' $D$ ' if odd.
(b) What is meant by Halting problem ? Explain its significance.
5. (a) Show that the function $f$ defined as $\Sigma^{2}(\Sigma=\{a, b\})$ defined by $f(x, y)=x . y$ is primitive recursive.
(b) Let $\mathrm{g}(x, y)=2^{x}+y-3$. Find $\mathrm{H}_{y}[\mathrm{~g}(x, y)=0]$.
(c) For the functions $f(x)=2 x^{3}+3 x^{2}+1$ and 5 $\mathrm{h}(x)=2 x^{3}-3 x^{2}+2$. Show that $\mathrm{h}(x)=2\left(x^{3}\right)$.

