Code No. : 5287/S

FACULTY OF INFORMATICS
B.E. 3/4 (IT) I Semester (Suppl.) Examination, July 2012
THEORY OF AUTOMATA

Time : 3 Hours] [Max. Marks : 75

Note : *Answer **all** questions from Part **A**.*
*Answer **any five** questions from Part **B**.*

PART – A **(25 Marks)**

1. Draw an NFA for the regular expression. 3
   $(a + b)^*$
2. Give a regular expression to accept strings of a's and b's of length ≤ 2. 2
3. Define left most derivation with an example. 2
4. State the pumping lemma for regular languages. 3
5. What is the advantage of a stack in a PDA ? 2
6. Eliminate all the unit productions from the grammar.
   $S \rightarrow Ao/B, B \rightarrow A/11, A \rightarrow o/12/B.$ 3
7. What is restricted turing machine ? 2
8. Define nondeterministic turing machine. 3
9. What is undecidability ? 2
10. State the Rice theorem. 3

PART – B **(50 Marks)**

11. Convert the following $\in$-NFA to DFA. 10

δ	$\in$	a	b	c
$\rightarrow$ p	ϕ	{p}	{q}	{r}
q	{p}	{q}	{r}	ϕ
*r	{q}	{r}	ϕ	{p}

12. a) Show that $L = \{a^n / n = K^2 \text{ for } k \geq 0\}$ is not regular. 5

    b) Explain the decision properties of regular languages. 5

13. a) Convert the following grammar to GNF form, 7

    $S \rightarrow AB1/O$

    $A \rightarrow OOA/B$

    $B \rightarrow |A|$

    b) State the pumping lemma for CFL. 3

14. Design a turing machine that computes a function f(m, n) = m ÷ n i.e, proper multiplication of two integers using subroutine concept. Where m ÷ n = m*n. 10

15. a) Define the classes of P, NP and explain the terms of NP-complete and NP-hard. 5

    b) Find the given instance of PCP has solution or not. 5

	List A	List B
i	w_i	x_i
1	1	111
2	10111	10
3	10	0

16. a) State Cook's theorem. 3

    b) Show that the following language is not regular. 7

    $L = \{a^i b^i / i >= 1\}$

17. Write short notes on the following :

    a) Universal TM. 4

    b) CFG. 3

    c) Applications of FA. 3