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**Question Paper Code : 31149**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Sixth Semester

Computer Science and Engineering

080230026 — THEORY OF COMPUTATION

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between a finite automaton and a Turing Machine.
2. When a language is said to be co-Turing recognizable?
3. Define mapping reducibility.
4. What is meant by an oracle for a language?
5. What is meant by a verifier for a language?
6. When is a language said to be NP-Complete?
7. Show the relationships among P, NP, PSPACE and EXPTIME with a neat diagram.
8. Draw a Boolean circuit that computes the parity function on four variables.
9. Define a language recognized by a probabilistic Turing machine with an error probability.
10. What is meant by a one way permutation?

PART B — (5 × 16 = 80 marks)

11. (a) Design a Turing machine for multiplication of two integers.

Or

- (b) Show that the set  $Q = \{m/n : m, n \text{ belongs to } \mathbb{N}\}$  is countable.

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12. (a) Prove that PCP is undecidable.

Or

(b) Prove that  $\text{Th}(\mathbb{N}, +)$  is decidable.

13. (a) Prove that 3SAT is polynomial time reducible to CLIQUE.

Or

(b) Prove that SUBSET-SUM is NP-Complete.

14. (a) State and prove Savitch's theorem.

Or

(b) Prove that  $\text{EQ}_{\text{REXT}}$  is EXPSPACE - Complete.

15. (a) Prove that #SAT  $\in$  IP.

Or

(b) Prove that  $\text{NL} \subseteq \text{NC}^2$ .