Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 13218

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

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. Define Turing Machine.

2. Relate recursive and recursively enumerable language.

3. Define Universal Language (L_u).

4. Define Information.

5. Is $x \wedge \urcorner(y \vee z)$ satisfiable?

6. State Node Cover problem.

7. Define Savitch theorem.

8. Define Boolean circuit.

9. Give examples for approximation algorithm.

10. State Chinese remainder theorem.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Construct a Turing machine for the set of all strings of balanced parenthesis. (8)

(ii) Show that 'every language accepted by a multitape Turing machine is recursively enumerable'. (8)

Or

(b) (i) Let f be the function $f(n) = n - 1$, when $n > 0$ and $f(0) = 0$. Show that f is decidable. (8)

(ii) Prove that Halting problem is undecidable. (8)

12. (a) (i) Prove that Modified Post Correspondence Problem (MPCP) reduces to Post Correspondence Problem (PCP). (8)

(ii) Convert the given TM with input string $w = 01$ to MPCP. (8)

$M = (\{q_1, q_2, q_3\}, \{0, 1\}, \{0, 1, B\}, q, \delta, B, \{q_3\})$

q_i	$\delta(q_i, 0)$	$\delta(q_i, 1)$	$\delta(q_i, B)$
q_1	$q_2, 1, R$	$q_2, 0, L$	$q_2, 1, L$
q_2	$q_3, 0, L$	$q_1, 0, R$	$q_2, 0, R$
q_3	–	–	–

Or

(b) (i) Define MIN_{TM}. Is MIN_{TM} Turing recognizable? Prove. (8)

(ii) Prove $REGULAR_{TM}$ = { <M> | M is a TM and L(M) is a regular language } is not decidable. (8)

13. (a) (i) Show that 'If P_1 is NP-Complete and there is a polynomial time reduction of P_1 to P_2, then P_2 is NP-Complete'. (8)

(ii) State traveling salesperson problem (TSP) and prove TSP is NP but not P. (8)

Or

(b) (i) State and prove Cook's theorem. (12)

(ii) Convert the expression $E = x\overline{y} + \overline{x}(y + z)$ into CNF. (4)

14. (a) Prove that Quantified Boolean Formulas (QBF) is PS-Complete.

Or

(b) (i) Prove that 'Every Problem in CoNL is also in NL'. (8)

(ii) State and prove Time Hierarchy Theorem. (8)

15. (a) (i) State Minimum Set cover (minSC) problem and prove minSC is NP Complete. (8)

(ii) Describe with an example Interactive Proof System. (8)

Or

(b) State and prove Fermat's Little Theorem.

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