

(Following Paper ID and Roll No. to be filled in your Answer Books)

PAPER ID : MI2

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M. TECH. (Sem.II)
THEORY EXAMINATION 2015-16
COMPLEXITY THEORY

Time : 3 Hours

Total Marks : 100

Note : (i) Attempt questions from each Section as per directions.
(ii) Be very precise in your answers.

1. Attempt any Two questions : (10×2=20)
 - (a) What are the different models of computational? Describe these models in comparative manner.
 - (b) If $f(n) = 100 * 2^n * n^5 + n$ then show that $f(n) = O(2^n)$.
 - (c) Prove that every Multi-tape Turing Machine has an equivalent Single-tape Turing Machine.

2. Attempt any Two questions : (10×2=20)
 - (a) Explain the terms of P, NP, NP Hard and NP COMPLETE with suitable example. Also give relation between them.
 - (b) What do you mean by complexity classes? Discuss the relationship among complexity classes.
 - (c) What do you mean by polynomial-time reduction? Assume 3 CNF satisfiability problem to NP Complete, prove clique problem is also NP-Complete.

3. Attempt any Two questions : (10×2=20)
- (a) What do you mean by an optimization problem? Why do we choose approximation algorithms to solve some of optimization problems?
 - (b) Explain the Cook's theorem with suitable example.
 - (c) Explain vertex and set cover problem with example.
4. Attempt any Two questions : (10×2=20)
- (a) Show that if there is a reduction from p_1 to p_2 then:
 - (i) If p_1 is undecidable then so is p_2 .
 - (ii) If p_1 is non-recursive enumerable then so is p_2 .
 - (b) Define non-isomorphism graph problem and give an interactive proof system to solve this problem.
 - (c) Explain the Gddel's incompleteness theorem with the help of examples.
5. Attempt any Two questions : (10×2=20)
- (a) Explain the completeness and soundness properties of probabilistically checkable proof system.
 - (b) Write short note on Quantum computing.
 - (c) Explain the Godel's incompleteness theorem with the help of examples.
