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

PAPER ID : 990072

Roll No.

# B.Tech.

## (SEM. VII) (ODD SEM.) THEORY EXAMINATION, 2014-15

## COMPUTATIONAL COMPLEXITY

Time : 3 Hours] [Total Marks : 100

**1.** Attempt any four questions: **5x4=20**

(a) Explain various model of computations with their relative merits and demerits.

(b) Discuss the time and space complexity with one example of each type of complexity.

(c) Discuss the role of complexity in algorithm development.

(d) Prove or disprove with following conjucture.

(I) $f(n)=O(g(n))$ implies $g(n)=O(f(n))$

(II) $f(n) + g(n) = \Theta(\min(f(n), g(n)))$ where $f(n)$ and $g(n)$ are the asymptotically positive functions.

(e) Write the scope and goals of computability in context of computational complexity/

(f) Drive the expression for computational complexity of a Fibonacci series?



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2 Attempt any four questions: **5x4=20**

(a) Discuss deterministic and nondeterministic complexities classes.

(b) State Rice theorem and its application in domain of complexity.

(c) Show that if there is reduction from P1 to P2 then prove that if P1 is undecidable then so P2 is.

(d) Explain the NP –complete problems with examples.

(e) What do you mean hardness and completeness in the context of complexity theory?

(f) Discuss the relationship among various complexities classes.

3 Attempt any four questions: **5x4=20**

(a) Write the steps of randomized version of quick sort algorithm with its complexity.

(b) Describe model for randomized computation with its advantages.

(c) What is logical characterization of NP in computational complexity explain with one example?

(d) Explain the general steps in establishing NP completeness proof of given problem.

(e) State Godel's incompleteness theorem and also give one example.

(f) Discuss briefly approximability and inapproximability.



4. Attempt any two questions: **10x2=20**

(a) Prove that a circuit satisfiability problem belongs to NP completeness class of problems.

(b) What is a parallel computation? Describe how complexity varies in case of parallel computation of summation of n numbers

(c) Write short notes on:

(I) Counting problems

(II) Interactive proofs.

5. Attempt any two questions: **10x2=20**

(a) Explain the completeness and soundness properties of probabilistically checkable proof system

(b) Explain the class of problem

(I) BPP

(II) RP

(III) CORP

(c) Write short notes:

(I) Communication complexity

(II) Quantum computation



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