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Chapterwise Previous Years' Solved Papers

2015-2000

GATE

Computer Science & Information Technology

Containing 3 Crack Papers



Nitesh Jain

Chapterwise
Previous Years'

SOLVED PAPERS
(2015-2000)

GATE
Computer Science & Information Technology

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卐 ISBN 978-93-5203-440-6

卐 Price : ₹ 295

Typeset by Arihant DTP Unit at Meerut

PRINTED & BOUND BY
ARIHANT PUBLICATIONS (I) LTD. (PRESS UNIT)

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Take a Ride of **SUCCESS** in **GATE 2016**

Graduate Aptitude Test in Engineering (GATE) is an all India examination that primarily tests the comprehensive understanding of various undergraduate subjects in Engineering and Technology. The GATE score of a candidate reflects a relative performance of that candidate. The score is used for admissions to post-graduate engineering programmes (e.g., M.E., M.Tech, direct Ph.D.) in Indian higher education institutes with financial assistance provided by MHRD and other Government agencies. The score may also used by Public sector units for employment screening purposes.

Most of the PSUs release their recruitment notifications right after the GATE notification, indicating that candidates have to take GATE to be considered for a job in their organisations.

So making a great score in GATE is very considerable for availing all these opportunities. Keeping the above point of view and after exhaustive research, I have come up with the Solved Papers of **Computer Science & Information Technology** for the aspirants who are preparing for GATE Exam. This book contains previous years' (2015-2000) GATE Solved Papers with their authentic solutions to help you getting a good score. The chapterwise solved papers in this book will help the students to find the solutions to their problems and to get through the exam without any difficulty. This integrated package of solved papers has been designed to know about the GATE Exam pattern and to put yourself into the real practice.

After going through this solved paper, aspirants can climb the ladder of success and fulfill their dreams.

I am thankful to Arihant Publications (India) Limited for giving me this opportunity to make such book which will help you to get 100% success in GATE exam.

Valuable suggestions are always welcome for further improvement.

Nitesh Jain

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GATE

Graduate Aptitude Test in Engineering

" Graduate Aptitude Test in Engineering is an all India level examination, conducted and controlled by the Indian Institute of Science in cooperation with seven Indian Institutes of Technology on behalf of the National Coordination Board – GATE, Department of Higher Education, Ministry of Human Resource Development (MHRD), and Government of India. The GATE committee which consists of representatives from the governing institutes is the sole authority for conducting the examination and declaring the results. "

GATE Eligibility Criteria

The following categories of candidates are eligible to appear in GATE

- Candidates with Bachelor Degree in Engineering/Technology/Architecture (4 years after 10+2) and those who are in the final of such programme.
- Candidates with Master Degree in any branch of Science/Mathematics/Statistics/ Computer Applications or its equivalent and those who are in the final year of such programme.
- Candidates in the second/third/higher year of the Four-year Integrated Master Degree Programme (Post B.Sc.) in Engineering/Technology, or 4th/5th year of Five-year Integrated Master Degree Programme and Dual Degree Programme in Engineering/ Technology
- Candidates with qualifications obtained through examinations conducted by professional societies recognized by UPSC/AICTE (e.g., AMIE by IE (I), AMICE (I) by the Institute of Civil Engineers (India) - ICE (I)) as equivalent to B.E. / B. Tech. The students who have completed his/ her Bachelor Degree in Engineering (4 years after 10+2) or equivalent of such professional courses are also eligible.

Examination Pattern

The GATE consists of a single paper of 3 hours duration, which contains 65 questions carrying maximum of 100 marks. The question paper is divided into three sections.
First section consists of 25 questions (1 to 25) of ONE MARK each.
Second section consists of 30 questions (26 to 55) of TWO MARKS each.
Third section consists of 10 questions (56 to 65) of ONE MARK (56 to 60) and of TWO MARKS (61 to 65) each.

Multiple Choice and Numerical Answer Type Questions

The question paper consist of multiple choice and numerical answer type questions. In multiple choice type question, each question has four choices for the answer. In numerical answer type questions, there will be no responses to mark at all. To enter a number as your answer, use the virtual numerical keyboard displayed on the monitor.

Zones and Institutes for GATE

The GATE is conducted and controlled through eight zones which are as follow

Zone 1 IISC, Bangalore	**Zone 2** IIT, Bombay	**Zone 3** IIT, Delhi	**Zone 4** IIT, Guwahati
Zone 5 IIT, Kanpur	**Zone 6** IIT, Kharagpur	**Zone 7** IIT, Madras	**Zone 8** IIT, Roorkee

GATE 2015 exam was conducted by IIT, Kanpur

Negative Marking in GATE Exam

Incorrect answer carry negative marks i.e., 0.33 for one mark questions and 0.66 for two marks questions. Also there is no negative marking for questions of numerical answer type.

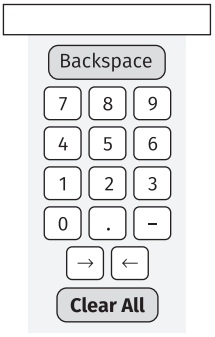
Answering a Question in Online Test

Procedure for answering a multiple choice type questions are as follows

- To select your answer, click on the button of one of the options.
- To deselect your chosen answer, click on the button of the chosen option again or click on the Clear Response button.
- To change your chosen answer, click on the button of another option, and to save your answer, you must click on the Save and Next button.
- To mark the question for review, click on the Mark for Review and Next button.

Procedure for answering a numerical answer type questions are as follows

- To enter a number as your answer, use the virtual numerical keypad displayed on the monitor.
- A fraction (e.g.,-0.3 or -.3) can be entered as an answer with or without '0' before the decimal point.
- To clear your answer, click on the Clear Response button and to save your answer, you MUST click on the Save and Next button.
- To mark the question for review, click on the Mark for Review and Next button.



Virtual Numerical Keypad

If an answer is entered for a question that is Marked for Review, that answer will be considered in the evaluation.

Formula for GATE Score of CE, CS, EC, EE and ME Papers

After the evaluation of the answer normalised marks based on the formula given below was calculated corresponding to the raw marks obtained by a candidate for CE, CS, EC, EE and ME papers. Normalised mark of jth candidate in i^{th}session $\overline{M}_{ij}$ in given by

$$\hat{M}_{ij} = \frac{\overline{M}_t^{\,g} - M_q^{\,g}}{\overline{M}_{ti} - M_{iq}} (M_{ij} - M_{iq}) + M_q^{\,g}$$

where,

- M_{ij} = the actual marks obtained by the jth candidate in i^{th} session
- $\overline{M}_t^{\,g}$ = the average marks of the top 0.1% of the candidates considering all sessions
- $M_q^{\,g}$ = the sum of mean and standard deviation marks of the candidates in the paper considering all sessions
- $\overline{M}_{ti}$ = the average marks of the top 0.1% of the candidates in the ith session
- M_{iq} = the sum of mean marks and standard deviation i^{th} session

Formula for GATE Score of all Papers

The formula for GATE score of all papers is given below

$$S = S_q + (S_t - S_q) \frac{M - M_q}{\overline{M}_t - M_q}$$

where,

- S = the GATE Score of the candidate,
- M = the marks obtained by the candidate in the paper appeared by the candidate in GATE 2013,
- M_q = the qualifying mark for general category candidates in the paper,
- $\overline{M}_t$ = the mean of marks of top 0.1% or top 10 (whichever is larger) of the candidates who appeared in the paper,
- S_t = 900 is the Score assigned to $\overline{M}_t$,
- S_q = 350 is the Score assigned to M_q.

M_q is usually 25 marks (out of 100) or μ+s, whichever is larger. Here μ is the mean and *s* is the standard deviation of marks of all the candidates who appeared in the paper.

GATE 2015 Cut-off Marks for Some Branches & Categorywise

BRANCH	GENERAL	SC/ST/PD	OBC (Non-Creamy)
Electronics & Communication Engineering	25.0	16.67	22.50
Electrical Engineering	25.0	16.67	22.50
Mechanical Engineering	32.73	21.82	29.46
Computer Science & IT	25.0	16.67	22.50
Civil Engineering	25.0	16.67	22.50

Paper Codes for GATE

- Aeronautical/Aerospace Engineering (AE)
- Agricultural Engineering (AG)
- Architecture and Planning (AR)
- Biotechnology (BT)
- Civil Engineering (CE)
- Chemical Engineering (CH)
- Computer Science and Information Technology (CS)
- Chemistry (CY)
- Electronics and Communication Engineering (EC)
- Electrical Engineering (EE)
- Geology and Geophysics (GG)
- Instrumentation Engineering (IN)
- Mathematics (MA)
- Mechanical Engineering (ME)
- Mining Engineering (MN)
- Metallurgical Engineering (MT)
- Physics (PH)
- Production and Industrial Engineering (PI)
- Textile Engineering and Fibre Science (TF)
- Engineering Science (XE)
- Life Science (XL)
- Ecology and Evolution (EY)

Recent Changes in GATE

2014

A new paper **Ecology and Evolution** is introduced in GATE 2014.

Examinations for all the 22 papers will be conducted by an ONLINE Computer Based Test (CBT).

GATE 2014 examination was held during forenoon and afternoon session on alternate weekends (Saturday and Sunday) between 1st February 2014 and 2nd March 2014. Examination for some of the papers in GATE 2014 was held in multiple sessions.

Application Fee has been revised again. It is ₹1500 for Male Candidates (General/OBC), ₹ 750 for Women Candidates of any category, ₹1500 for Other Candidates (General/OBC) and ₹750 SC / ST / PwD* Category Candidates

In terms of pattern, only multiple choice questions and numerical answer type questions are asked, there was no coverage of common date and linked answer type questions.

2013

Female candidates are exempted from paying the application fee.

Candidates are required to upload scanned copy of Photograph and Signature.

The Application fee was increased from ₹1000 to ₹1200.

2012

Only final year students and passout students were eligible to write GATE exam.

The application process was made completely online, candidates could view their responses of the ORS and also GATE Office released official solutions for GATE papers.

PLAN Your Study to **KNOCK OUT** the Exam

1. **Planning your study after analysing previous years' papers**

   You must plan your study after taking the analysis of previous years' GATE papers. This will give you the idea that which subject usually has the highest weightage in GATE exam and about the topics asked from the particular subject most. After the analysis of previous years' papers of Computer Science & IT, you will be able to make the list of topics to be studied on the priority basis. You also will be able to prepare time schedule to study individual topics.

2. **Prefer standard books for GATE**

   Make an extensive search for standard books in the library and go for the best ones. Try to cover complete syllabus within the time you have (5 or 6 months). If it isn't possible, get expertise in the topics you have studied.

3. **Group study is a great comrade**

   Group study is one of the best ways for preparation of GATE. Assign a few sections/topics to your friend and you focus on the remaining. Then have a brief session and discussion and exchange what both of you have studied/gained. This not only saves your time and efforts but also enhances understanding on the topics/concepts.

4. **Solve the previous years' GATE papers**

   Solve previous years' GATE papers to understand what the actual paper would be like. It also brushes up your mind and tells you the weaknesses in the subject knowledge. So try to solve as many test papers as you can. This is the best way to prepare and get through the GATE.

5. **Practice Sets is a great platform to check yourself**

   Attempt all the 65 questions given in a practice set and then check yourself step by step by considering the answer with solutions given along with each practice set. Because, the practice sets are designed based exactly on the latest exam pattern, hence you will find your strongest and weakest points related to all sections i.e., Aptitude, Mathematics and Engineering disciplines in a particular topic. So, keep practicing and secure your success in GATE.

6. **Analyse your results**

   Analysing the results from your solved questions from the practice sets and solved papers is very significant. If you do not analyse, it does not add value to your performance. You should check and find out where you have mistaken and could have scored more. Know your accuracy rates in various topics and prepare a topicwise datasheet to make record of your performance in different solved papers and practice sets.

7. **Keep the time for Revision**

   As time management is an important factor to crack the exam. Hence, give the appropriate time to each subject and complete that subject within your time schedule. After completion of the whole syllabus, you must have time for the quick revision.

TIPS and TACTICS for a **Successful** Attempt

1. **Read Carefully**
   Make it a habit of always reading the instructions on the front page carefully. Also, before attempting the questions, always read and understand the directions given to attempt a question so that scope for blunders is reduced.

2. **Solve The Easy Questions First**
   Try to bifurcate the questions according to the difficulty level. Always try and attempt the easy questions first as this saves a lot of time. Time management plays a vital part in achieving success.

3. **Strike Off The Wrong Options**
   Try to strike off the wrong options. The options which cannot be the answer even a slightest bit and for which you are cent percent sure, should be separated from the probable answer so that you are able to concentrate on the remaining options and hence you find out the answer easily.

4. **Don't Waste Excessive Time On One Question**
   If you are not able to strike off the wrong options and are unsure of the correct answer then don't waste excessive time as doing so, will lead to a decrease in remaining time and hence other question will suffer.

5. **Use Scribble Pad**
   You can use the scribble pad provided for rough work. You can jot down the points, ideas etc so that least number of mistakes are made while framing the final answer.

6. **Try To Attempt The Leftover Questions Once More**
   After completing all the question go back to the leftover questions and try to give it a shot and solve it once more.

7. **Keep A Time Check**
   During the examination do keep an eye on the time. Try to save time so that you are left with some time to attempt the leftover questions. Try to finish the exam early so that you are left with some amount of time to revise the whole paper once.

8. **Use The Option Of Mark For Review**
   The answer will be considered in the evaluation if an answer is entered for a question that is marked for review.

9. **Use Virtual Numerical Keypad**
   Although, there is no negative marking for numerical answer type questions, but entered a number as your answer if you are sure about that because, these type of questions containing a particular numerical value.

GATE Syllabus for

Computer Science & Information Technology

Engineering Mathematics

Mathematical Logic

Propositional logic; First order logic.

Probability

Conditional probability; Mean, median, mode and standard deviation; Random variables; Distributions: uniform, normal, exponential, Poisson, Binomial.

Set Theory and Algebra

Sets; Relations; Functions; Groups; Partial Orders; Lattice; Boolean algebra.

Combinatorics

Permutations; Combinations; Counting; Summation; Generating functions; Recurrence relations; Asymptotics.

Graph Theory

Connectivity; Spanning trees; Cut vertices and edges; Covering; Matching; Independent sets; Colouring; Planarity; Isomorphism.

Linear Algebra

Algebra of matrices, Determinants, systems of linear equations, Eigen values and Eigen vectors.

Numerical Methods

LU decomposition for systems of linear equations; Numerical solutions of non-linear algebraic equations by Secant, Bisection and Newton-Raphson methods; Numerical integration by trapezoidal and Simpson's rules.

Calculus

Limit, Continuity and differentiability, Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial derivatives, Total derivatives, Maxima and minima.

Computer Science and Information Technology

Digital Logic

Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).

Computer Organization and Architecture

Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

Programming and Data Structures

Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.

Algorithms

Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, Upper and lower bounds, Basic concepts of complexity classes P, NP, NP-hard, NP-complete.

Theory of Computation

Regular languages and finite automata, Context-free languages and Push-down automata, Recursively enumerable sets and turing machines, Undecidability.

Compiler Design

Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.

Operating System

Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems, Protection and security.

Databases

ER model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Sequential Query Languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

GATE 2015

an *Elaboration*

Computer Science & IT

The Graduate Aptitude Test in Engineering (GATE-2015) Computer Science & IT papers were conducted successfully on 7th Feb, 2015 in two different sessions across India. The exam threw no surprises on the candidates and was in accordance with the pattern specified in the exam prospectus. This paper consists of 65 questions with a maximum score of 100 marks in each.

In GATE 2015, there was a stronger emphases on **Data Structure** and **Algorithms** and the difficulty level was difficult as compared to last year paper.

Computer Science & IT

Subject	Marking Scheme	Total Marks
Discrete Mathematics	2 × 1 + 3 × 2	8
Digital Logic	1 × 1 + 2 × 2	5
Computer Organisation	1 × 1 + 2 × 2	5
Theory of Computation	1 × 1 + 3 × 2	7
Data Structure & Algorithms	9 × 1 + 7 × 2	23
Compiler Design	2 × 1 + 1 × 2	4
Operating System	2 × 1 + 2 × 2	6
DBMS	1 × 1 + 2 × 2	5
Computer Networks	2 × 1 + 3 × 2	8
Software Engg. & Web Technology	2 × 1 + 2 × 2	6
Engineering Mathematics	2 × 1 + 3 × 2	8
Verbal Ability	3 × 1 + 2 × 2	7
Numerical Ability	2 × 1 + 3 × 2	8
Total Marks		**100**

GATE 2014

an *Elaboration*

Computer Science & IT

The Graduate Aptitude Test in Engineering (GATE-2014) Computer Science & IT papers were conducted successfully on 1st and 2nd March, 2014 across India. The exam threw no surprises on the candidates and was in accordance with the pattern specified in the exam prospectus except common data and linked answer questions because there were no coverage of these types of questions in GATE 2014. This paper consists of 65 questions with a maximum score of 100 marks in each.

In GATE 2014, there was a stronger emphases on **Engineering Mathematics** and **Data Structures** and **Algorithms** and the difficulty level is easy as compared to last year paper. Computer Science & Information Technology papers require students to be strong in fundamentals to do well and this year the same trend was followed.

Computer Science & IT

Subject	Marking Scheme	Total Mark	Focused Area
Data Structure and Algorithms	5 × 1 + 5 × 2	15	C-programs, Time complexity, NP complete, Quick sort and Analyzing algorithms
DBMS	2 × 1 + 3 × 2	8	Finding candidate keys, Normal forms, Minimal cover, SQL and Conflict serializability
Theory of Computation	2 × 1 + 2 × 2	6	Regular expression, Finite automata and Closure properties
Compiler Design	1 × 1 + 1 × 2	3	SR & RR conflicts and Code optimization
Computer Organization	1 × 1 + 3 × 2	7	Addressing mode and Cache organization
Computer Networks	2 × 1 + 3 × 2	8	Network security, Routing protocols and Efficiency of SR protocol
Digital Logic	2 × 1 + 1 × 2	4	Multiplexer, SOP and Radix
Operating Systems	2 × 1 + 3 × 2	8	SRTF, Optimal page replacement and Multi-threading
Software Engg. & Web Technology	2 × 1	2	Software models
Engineering Mathematics and Discrete Mathematics	6 × 1 + 9 × 2	24	Distribution, Matrix, Limit, Numerical analysis
English	4 × 1 + 1 × 2	6	Sentence correction, fill in the blank, Synonym, Reading comprehension
General Aptitude	1 × 1 + 4 × 2	9	Number Series, Time & Distance, Probability, Work and Wages
Total Marks		**100**	

GATE 2013

an *Elaboration*

Computer Science & IT

The Graduate Aptitude Test in Engineering (GATE-2013) was conducted successfully on 10 Feb, 2013 across India. The exam threw no surprises on the candidates and was in accordance with the pattern specified in the exam prospectus. This paper consists of 65 questions with a maximum score of 100 marks.

In GATE 2013, there was a stronger emphases on Computer Organization and the difficulty level is easy as compared to last year paper. Computer Science & Information Technology paper requires students to be strong in fundamentals to do well and this year the same trend was followed.

Computer Science & IT

Subject	Marking Scheme	Total Mark	Focused Area
Programming in C	2 + 2 × 2 (Common Data)	6	Function, Array, Pointer
Data Structure	2 × 2	4	Time complexity, Tree
Design Analysis & Algorithm	3 × 1 + 2 × 2	7	Sorting, Tree, Graph, Queue
Computer Network	3 × 1 + 2 × 2	7	Transport Layer, Symmetric key crypotgraphy, Network layer, Ethernet LAN, Datagram format
Operating System	2 × 1 + 2 × 2	6	CPU Scheduling, Process synchronization
DBMS	1 × 1 + 1 × 2 + 2 × 2 (Linked Question)	7	File indexing, Relation algebra query, Functional Dependency & Normalization
Digital Logic	3 × 1 + 1 × 2	5	Number representation, Combinational circuit, Boolean Algebra
TOC	3 × 1 + 3 × 2	9	Regular language, Turing machine, Undesidability, Context free language, Finite automata
Compiler Design	1 × 1 + 1 × 2 + 2 × 2 (Common Data)	7	Bottom up parser, LR, LALR parser, Intermediate code generation
Computer Organization	1 × 1 + 3 × 2 + 2 × 2 (Linked Question)	11	Memory mapping, Micro operation, Secondary storage device, Pipelining.
Software Engg. & Web Technology	1 × 1 + 1 × 2	3	Inter process communication (Technology), Cohesion and Coupling
Discrete Mathematics	3 × 1 + 3 × 2	9	Groups, Graph Inference rules
Engineering Mathematics	4 × 1	4	Distribution, Matrix, Limit, Numerical analysis
English	4 × 1 + 1 × 2	6	Sentence correction, fill in the blank, Synonym, Reading comprehension
General Aptitude	1 × 1 + 4 × 2	9	Number Series, Time & Distance, Probability, Work and Wages
Total Marks		**100**	

GATE 2015

Solved Paper

Computer Science & IT

Solved Paper 2015

GATE Computer Science & IT

Time : 3 hrs **MM :** 100

Read the following instructions carefully

1. There are 65 questions carrying 100 marks of 3 hrs duration in this paper.
2. Questions 1 to 25 carry 1 mark each and questions 26 to 55 carry 2 marks each.
3. Questions 56 to 65 belong to General Aptitude (GA) Type. Questions 56 to 60 carry 1 mark each and questions 61 to 65 carry 2 marks each.
4. Unattempted questions will carry zero marks.
5. For questions 1 to 25 and 56 to 60, 1/3 mark will be deducted for each wrong answer. For questions 26 to 55 and 61 to 65, 2/3 mark will be deducted for each wrong answer.
6. There is no negative marking for numerical answer type questions.
7. Non-programmable type calculator is allowed. Charts, graph sheets and mathematical tables are not allowed in the examination hall.

(1 *Mark Questions*)

1. Match the following lists :

List I	List II
A. Condition coverage	1. Black-box testing
B. Equivalence class partitioning	2. System testing
C. Volume testing	3. White-box testing
D. Alpha testing	4. Performance testing

Codes

(a) A-2, B-3, C-1, D-4
(b) A-3, B-4, C-2, D-1
(c) A-3, B-1, C-4, D-2
(d) A-3, B-1, C-2, D-4

Sol. (d) **Condition coverage** testing to devise a good set of white-box test cases is to consider the control flow of the program. The control flow of the program is represented in a flow graph. We consider various aspects of this flow graph in order to ensure that we have an adequate set of test cases.

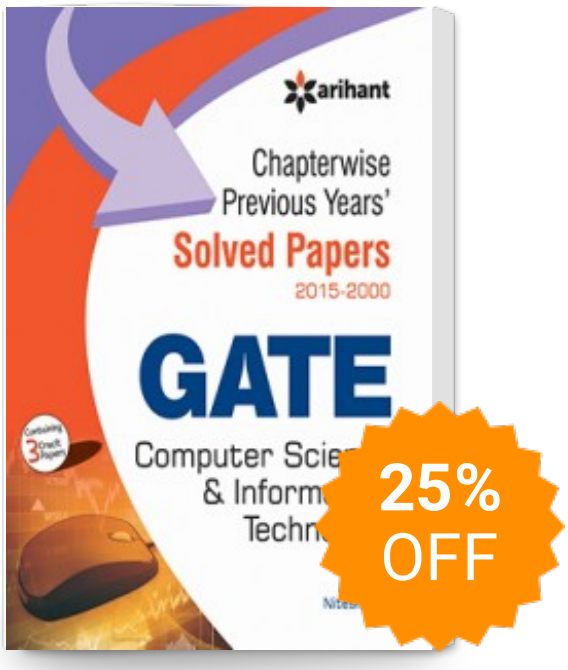
The adequacy of the test cases is often measured with a metric called coverage. Coverage is a measure of the completeness of the set of test cases.

Equivalence class Partitioning (EP) is a specification-based or black-box testing technique. It can be applied at any level of testing and is often a good technique to use first.

System testing of software or hardware is a testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. The following examples are different types of testing that should be considered during system testing:

(i) Software performance testing
(ii) Load testing
(iii) Volume testing
(iv) Stress testing
(v) Security testing
(vi) Regression testing
(vii) Maintenance testing
(viii) Recovery testing

Chapterwise Previous Years' Solved Papers (2015-2000) GATE Computer Science and Information Technology



Publisher : Arihant Publications ISBN : 9789352034406 Author : Nitesh Jain

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