# IT Interview Questions

#### A Primer For The IT Job Interviews

## By Narasimha Karumanchi

## Copyright ©2014 by CareerMonk Publications

All rights reserved.

Designed by Narasimha Karumanchi

Copyright ©2014 CareerMonk Publications. All rights reserved.

All rights reserved. No part of this book may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without written permission from the publisher or author.

#### Acknowledgements

Mother and father, it is impossible to thank you adequately for everything you have done, from loving me unconditionally to raising me in a stable household, where you persistent efforts traditional values and taught your children to celebrate and embrace life. I could not have asked for better parents or role-models. You showed me that anything is possible with faith, hard work and determination.

This book would not have been possible without the help of many people. I would like to thank them for their efforts in improving the end result. Before we do so, however, I should mention that I have done my best to correct the mistakes that the reviewers have pointed out and to accurately describe the protocols and mechanisms. I alone am responsible for any remaining errors.

First and foremost, I would like to express my gratitude to many people who saw me through this book, to all those who provided support, talked things over, read, wrote, offered comments, allowed me to quote their remarks and assisted in the editing, proofreading and design. In particular, I would like to thank the following individuals.

- *Mohan Mullapudi*, IIT Bombay, Architect, dataRPM Pvt. Ltd.
- Navin Kumar Jaiswal, Senior Consultant, Juniper Networks Pvt. Ltd.
- A. Vamshi Krishna, IIT Kanpur, Mentor Graphics Pvt. Ltd.
- Kiran Kumar Pasupuleti, IISc, Bangalore
- Hirak Chatterjee, Yahoo India Pvt. Ltd.
- Suresh Kodati, Development Manager, IBM Software Labs
- Balakrishna Veerala, M-Tech., Factuly, GATE Subjects.
- Kondrakunta Murali Krishna, B-Tech., Technical Lead, HCL
- Kota Veeraiah, Head Master, Obulasuni Palle, Z. P. H. School
- Potla Venkateswarlu, Teacher, Kambhampadu, Z. P. H. School
- Muralidhar, Teacher, Durgi
- Chaganti Siva Rama Krishna Prasad, Founder, StockMonks Pvt. Ltd.
- *Naveen Valsakumar*, Co-Founder, NotionPress Pvt. Ltd.
- Ramanaiah, Lecturer, Nagarjuna Institute of Technology and Sciences, MLG

-Narasimha Karumanchi M. Tech, IIT Bombay Founder, CareerMonk.com

#### **Preface**

#### Dear Reader,

**Please Hold on!** I know many people do not read the preface. But I would strongly recommend that you go through the preface of this book at least.

India has many of the key ingredients for making this transition. It has a critical mass of skilled, English-speaking knowledge workers, especially in the sciences. It has a well-functioning democracy. Its domestic market is one of the world's largest. It has a large and impressive scattering, creating valuable knowledge linkages and networks. In addition, the development of the IT sector in recent years has been remarkable. India has created profitable niches in information technology (IT) and is becoming a global provider of software services.

Many software companies hire graduates with different back-grounds computer science, electrical, civil, mechanical, B.E., B. Tech., MCAs, MBAs etc. The year 2013-14 characterizes a landmark year as aggregate revenue for the Indian IT-BPO sector is estimated to cross USD 120 billion.

India currently produces a solid core of knowledge workers in tertiary and scientific and technical education, although the country needs to do more to create a larger cadre of educated and agile workers who can adapt and use knowledge. Efforts have been put into establishing a top-quality university system that includes many world-class institutions of higher learning that are competitive and meritocratic, such as Indian Institutes of Technology (IITs), Indian Institutes of Management, Indian Institute of Science, and the National Institute of Technology (NITs). Despite these efforts, not all publicly funded universities or other educational institutions in India have been able to maintain high-quality standards or keep pace with developments in knowledge and technology.

IT Interview Questions try to facilitate pupils who arrive from colleges where they could not find proper assistance for career counselling.

There are hundreds of books on IT interviews already flooding the market. You may naturally wonder what the need of writing another book on IT interviews is! This book assumes you have basic knowledge about computer science. Main objective of the book is *not* to provide you the *catalog* of *IT interview questions* and *their answers*. Before writing the book, I set myself the following *goals*:

- The book be written in *such* a *way* that students from non-IT branches should be able to understand it *easily* and *completely*.
- The book should present the concepts in *simple* and straightforward manner with a *clear cut* explanation.
- The book should provide enough *realtime* examples so that students get better understanding of the *IT interview questions* and also useful for the *campus/off-campus* interviews.
- It should challenge you to look at the small but signifcant changes you need to make to improve your impact at interviews.
- In this book you will learn all the secrets you need to know to help nail your job interview and get the job.

Please remember, the books which are available in the market are lacking one or many of these goals. This book is different from other books available on the market. The main goals of this book are to provide students with a good knowledge base, and to offer a better understanding to those new to IT. Based on my experience, I thought of writing this book aiming at achieving these goals in a simple way. A 3-stage formula is used in writing this book, i.e.

I used very simple language such that a school going student can also understand the concepts easily. Once the concept is discussed, it is then interlaced into problems. The solutions of each and every problem are well explained. Finally, interview questions with answers on every concept are covered. All the interview questions in this book are collected from various interviews conducted by top software development companies.

Interviewing is all about research, confidence and creating a good rapport. Everyone is nervous on interviews. If you simply allow yourself to feel nervous, you'll do much better. Remember also that it's difficult for the interviewer as well. In general, be upbeat and positive. Never be negative. As a job seeker if you read complete book with good understanding, I am sure you will challenge the interviewers and that is the objective of this book.

It is *recommended* that, at least *one complete* reading of this book is required to get full understanding of all the topics. In the *subsequent* readings, you can directly go to any chapter and refer. Even though, enough readings were given for correcting the errors, due to human tendency there could be some minor typos in the book. If any such typos found, they will be updated at *CareerMonk.com*. I request you to constantly monitor this site for any corrections, new problems and solutions. Also, please provide your valuable suggestions at: *Info@CareerMonk.com*.

Wish you all the best. I are sure that you will find this book useful.

-Narasimha Karumanchi M. Tech, IIT Bombay Founder, CareerMonk.com

### **Table of Contents**

1.	. Organization of Chapters	17
	1.1 Why Separate Book on IT Interviews?	17
	1.2 What Is this Book About?	17
	1.3 Should I Take this Book?	18
	1.4 Organization of Chapters	18
2.	. Getting Ready	22
	2.1 Best Ways To Get An Interview Call	22
	2.2 Reasons Why You Are Not Getting Interview Calls	23
	2.3 Does Your GPA (or Percentage) Really Matter?	25
	2.4 Hot Tips On Resume Writing	27
	2.5 Designing The Resume	32
	2.6 Sample Resume	34
3.	. Group Discussions	37
	3.1 What is Group Discussion?	37
	3.2 Group Discussions in Interviews	37
	3.3 Group Discussions at Universities/Colleges	38
	3.4 How to Face Group Discussion in Interviews?	38
	3.5 Points to Remember	40
	3.6 Tips for Group Discussion	41
	3.7 Do's of a Group Discussion	43
	3.8 Topics for Practicing Group Discussions	44
	3.9 Mock Group Discussions	46
4.	. Operating System Concepts	54
	4.1 What is an Operating System?	54
	4.2 Types of Operating Systems	54
	4.3 Memory Management	55
	4.4 What is Job Scheduling and a Process?	60
	4.5 Processor Scheduling Algorithms	62
	4.6 Process Synchronization	63
	4.7 Interprocess Communication [IPC]	66
	4.8 Starvation and Aging	70
	4.9 Complier and Interpreter	71
	4.10 Process Loading and Linking	71
	Problems and Questions with Answers	74

5.	C/C++/Java Interview Questions	81
	5.1 Variables	- 81
	5.2 Data types	- 81
	5.3 Data Structure	- 82
	5.4 Abstract Data Types (ADTs)	- 82
	5.5 Memory and Variables	- 83
	5.6 Pointers	- 84
	5.7 Techniques of Parameter Passing	- 87
	5.8 Binding	- 90
	5.9 Scope	- 91
	5.10 Storage Classes	- 93
	5.11 Storage Organization	- 97
	5.12 Programming Techniques	- 99
	5.13 Basic Concepts of OOPS	101
	Problems and Questions with Answers	105
6.	Scripting Languages	157
	6.1 Interpreter versus Compiler	157
	6.2 What Are Scripting Languages?	158
	6.3 Shell Scripting	158
	6.4 PERL [Practical Extraction and Report Language]	166
	6.5 Python	188
7.	Bitwise Hacking	194
	7.1 Introduction	194
	7.1 Hacks on Bitwise Programming	194
	Problems and Questions with Answers	198
8.	Concepts of Computer Networking2	203
	8.1 What is a Computer Network?	203
	8.2 Basic Elements of Computer Networks	203
	8.3 What is an Internet?	204
	8.4 Fundamentals of Data and Signals	204
	8.5 Network Topologies	207
	8.6 Network Operating Systems	211
	8.7 Transmission Medium	212
	8.8 Types of Networks	214
	8.9 Connection-oriented and Connectionless services	217
	8.10 Segmentation and Multiplexing	218
	8.11 Network Performance	218
	8.12 Network Switching	222

8.13 Why OSI Model?	229
8.14 What is a Protocol-Stack?	229
8.15 OSI Model	229
8.16 TCP/IP Model	234
8.17 Difference between OSI and TCP/IP models	236
8.18 How does TCP/IP Model (Internet) work?	237
8.19 Understanding Ports	239
8.20 Hypertext Transfer Protocol [HTTP]	240
8.21 Simple Mail Transfer Protocol [SNMP]	243
8.22 File Transfer Protocol [FTP]	244
8.23 Domain Name Server [DNS]	245
8.24 Dynamic Host Configuration Protocol [DHCP]	250
8.25 How traceroute (or tracert) works?	252
8.26 How ping works?	253
8.27 What is QoS?	253
8.28 Wireless Networking	254
Problems and Questions with Answers	255
9. Database Management Systems	256
9.1 What is a Database?	256
9.2 Database Management System [DBMS]	256
9.3 Procedural and Non-Procedural	257
9.4 What is SQL?	257
9.5 Data Definition and Manipulation	257
9.6 What is RDBMS?	257
9.7 What is Table?	257
9.8 What is Field?	257
9.9 What is Record or Row?	258
9.10 What is Column?	258
9.11 What is NULL value?	258
9.12 SQL Constraints	258
9.13 Data Integrity	258
9.14 Database Keys	259
9.15 Normalization	259
9.16 Functional Dependencies	262
9.17 First Normal Form or 1NF	
9.18 Second Normal Form or 2NF	263
9.19 Third Normal Form or 3NF	264
9.20 Other Normal Forms	265

	Problems and Questions with Answers	265
1	0. Brain Teasers	-271
	Problems and Questions with Answers	271
1	1. Algorithms Introduction	-274
	11.1 What is an Algorithm?	274
	11.2 Why Analysis of Algorithms?	274
	11.3 Goal of Analysis of Algorithms	274
	11.4 What is Running Time Analysis?	275
	11.5 How to Compare Algorithms?	275
	11.6 What is Rate of Growth?	275
	11.7 Commonly used Rate of Growths	275
	11.8 Types of Analysis	276
	11.9 Asymptotic Notation and Big-O Notation	276
	11.10 Why is it called Asymptotic Analysis?	278
	11.11 Guidelines for Asymptotic Analysis	278
	11.12 Amortized Analysis	279
	Problems and Questions with Answers	280
1	2. Recursion and Backtracking	-285
	12.1 Introduction	285
	12.2 What is Recursion?	285
	12.3 Why Recursion?	285
	12.4 Format of a Recursive Function	285
	12.5 Recursion and Memory (Visualization)	286
	12.6 Recursion versus Iteration	287
	12.7 Notes on Recursion	287
	12.8 Example Algorithms of Recursion	287
	Problems and Questions with Answers	288
	12.9 What is Backtracking?	289
	12.10 Example Algorithms of Backtracking	289
	Problems and Questions with Answers	289
1	3. Linked Lists	-290
	13.1 What is a Linked List?	290
	13.2 Linked Lists ADT	290
	13.3 Why Linked Lists?	290
	13.4 Arrays Overview	291
	13.5 Linked Lists Versus Arrays and Dynamic Arrays	292
	13.6 Singly Linked Lists	292
	13.7 Doubly Linked Lists	297

13.8 Circular Linked Lists	302
13.9 A Memory-Efficient Doubly Linked List	307
Problems and Questions with Answers	308
14. Stacks	322
14.1 What is a Stack?	322
14.2 How Stacks are used?	322
14.3 Stack ADT	323
14.4 Applications	323
14.5 Implementation	323
14.6 Comparison of Implementations	328
Problems and Questions with Answers	328
15. Queues	336
15.1 What is a Queue?	336
15.2 How are Queues Used?	336
15.3 Queue ADT	336
15.4 Exceptions	337
15.5 Applications	337
15.6 Implementation	337
Problems and Questions with Answers	343
16. Trees	345
16.1 What is a Tree?	345
16.2 Glossary	345
16.3 Binary Trees	346
16.4 Types of Binary Trees	347
16.5 Properties of Binary Trees	348
16.6 Binary Tree Traversals	349
Problems and Questions with Answers	353
16.7 Generic Trees (N-ary Trees)	366
Problems and Questions with Answers	368
16.8 Threaded Binary Tree Traversals	368
Problems and Questions with Answers	374
16.9 Binary Search Trees (BSTs)	375
Problems and Questions with Answers	381
16.10 Balanced Binary Search Trees	386
16.11 AVL (Adelson-Velskii and Landis) Trees	387
Problems and Questions with Answers	394
17. Priority Queues and Heaps	397
17.1 What is a Priority Queue?	

17.2 Priority Queue ADT	397
17.3 Priority Queue Applications	398
17.4 Heaps and Binary Heap	398
17.5 Binary Heaps	399
17.6 Heapsort	404
Problems and Questions with Answers	405
18. Graph Algorithms	407
18.1 Introduction	407
18.2 Glossary	407
18.3 Applications of Graphs	410
18.4 Graph Representation	410
18.5 Graph Traversals	413
18.6 Shortest Path Algorithms	416
19. Sorting	417
19.1 What is Sorting?	417
19.2 Why is Sorting necessary?	417
19.3 Classification of Sorting Algorithms	417
19.4 Other Classifications	418
19.5 Bubble sort	418
19.6 Selection Sort	419
19.7 Insertion sort	420
19.8 Shell sort	422
19.9 Merge sort	423
19.10 Heapsort	425
19.11 Quicksort	425
19.12 Tree Sort	428
19.13 Comparison of Sorting Algorithms	428
19.14 Linear Sorting Algorithms	428
19.15 Counting Sort	428
19.16 Bucket sort [or Bin Sort]	429
19.17 Radix sort	430
19.18 External Sorting	430
Problems and Questions with Answers	431
20. Searching	441
20.1 What is Searching?	441
20.2 Why do we need Searching?	441
20.3 Types of Searching	441
20.4 Unordered Linear Search	441

	20.5 Sorted/Ordered Linear Search	442
	20.6 Binary Search	442
	20.7 Comparing Basic Searching Algorithms	443
	Problems and Questions with Answers	443
2	1. Hashing	- 466
	21.1 What is Hashing?	466
	21.2 Why Hashing?	466
	21.3 HashTable ADT	466
	21.4 Understanding Hashing	466
	21.5 Components of Hashing	468
	21.6 Hash Table	468
	21.7 Hash Function	468
	21.8 Load Factor	469
	21.9 Collisions	469
	21.10 Collision Resolution Techniques	469
	21.11 Separate Chaining	469
	21.12 Open Addressing	470
	21.13 Comparison of Collision Resolution Techniques	471
	21.14 How Hashing Gets O(1) Complexity?	471
	21.15 Hashing Techniques	471
	21.16 Problems for which Hash Tables are not suitable	472
2	2. String Algorithms	- 473
	22.1 Introduction	473
	22.2 String Matching Algorithms	473
	22.3 Brute Force Method	474
	22.4 Robin-Karp String Matching Algorithm	474
	22.5 KMP Algorithm	475
	Problems and Questions with Answers	478
2	3. Algorithms Design Techniques	- 480
	23.1 Introduction	480
	23.2 Classification	480
	23.3 Classification by Implementation Method	480
	23.4 Classification by Design Method	481
	23.5 Other Classifications	482
2	4. Greedy Algorithms	- 483
	24.1 Introduction	483
	24.2 Does Greedy Always Work?	483
	24.3 Advantages and Disadvantages of Greedy Method	483

24.4 Greedy Applications	483
24.5 Understanding Greedy Technique	484
25. Divide and Conquer Algorithms	487
25.1 Introduction	487
25.2 What is Divide and Conquer Strategy?	487
25.3 Does Divide and Conquer Always Work?	487
25.4 Divide and Conquer Visualization	487
25.5 Understanding Divide and Conquer	488
25.6 Advantages of Divide and Conquer	489
25.7 Disadvantages of Divide and Conquer	489
25.8 Divide and Conquer Applications	489
26. Dynamic Programming	490
26.1 Introduction	490
26.2 What is Dynamic Programming Strategy?	490
26.3 Can Dynamic Programming Solve All Problems?	490
26.4 Examples of Dynamic Programming Algorithms	490
26.5 Understanding Dynamic Programming	491
27. Basics of Design Patterns	494
27.1 Brief History Of Design Patterns	494
27.2 Why Design Patterns?	494
27.3 Categories Of Design Patterns	494
27.4 What To Observe For A Design Pattern?	495
27.5 Using Patterns To Gain Experience	496
27.6 Can We Use Design Patterns Always?	496
27.7 Design Patterns vs. Frameworks	497
27.8 Creational Design Patterns	497
27.9 Singleton Design Pattern	498
27.10 Structural Design Patterns	501
27.11 Behavioral Design Patterns	502
28. Non-Technical Help	504
28.1 Tips	504
Questions with Answers	505
29. Quantitative Aptitude Concepts	510
29.1 Formulas on Number Series	510
29.2 Tips on Divisibility Checks	510
29.3 Mathematical Formulas	511
29.4 Ratios and Proportions	511

29.5 Percentage	511
29.6 Profit and Loss	512
29.7 Volumes and Surface Areas	512
29.8 Logarithms	513
29.9 Formulae for Trains Problems	514
29.10 Indices	514
29.11 Surds	514
29.12 Clock	515
29.13 Blood Relations Tricks	516
29.14 Probability	516
29.15 Banker's Discount	520
29.16 Simple Interest	520
29.17 Compound Interest	520
29.18 Pipes	521
29.19 Stocks and Shares	521
30. Basics of Cloud Computing	523
30.1 What is Cloud Computing?	523
30.2 Organizations are interested in Cloud Computing	524
30.3 Evolution of Cloud Computing	524
30.4 Cloud Deployment Models	525
30.5 Types of Cloud Computing Services	526
30.6 Advantages of Cloud Computing	526
30.7 Clustering	528
30.8 Grid Computing	529
30.9 Virtualization	530
30.10 Big Data	534
31. Miscellaneous Concepts	538
31.1 Basics of HTML and CSS	538
31.2 Javascript	545
31.3 TeX and LaTeX	546
31.4 Ruby on Rails	547
31.5 Google Search Tips	547
31.6 Web Crawling	552
31.7 Google's Page Ranking Algorithm	553
31.8 Basics of XML	554
32. Career Options	558
32.1 Campus Placement	
32.2 Going for M. Tech./M.S. in India	

32.3 Going for M.S. in Foreign Countries	-559
32.4 Going for MBA	-559
32.5 Entrepreneurship-Start your venture	-560
32.6 Trying for Government Jobs and Civil Services	-560
32.7 Final Notes	-560
32.8 Tips to Become Successful in Your Career	-560
References	-563