GATE ONLINE CLASSES
ON
DATA STRUCTURES

Presented by

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Day – 1 Lecture Notes

on

DATA STRUCTURES

GATE ONLINE CLASSES

PART – 1
INFORMATION RELATED TO GATE

- Agenda:
  - Importance of GATE
  - Benefits of GATE
  - When to start preparation for GATE
  - General tips for GATE
  - Tentative Schedule of GATE – 2021
  - Exam Pattern for GATE – 2021
  - Expected Cutoff Marks for GATE – 2021
  - Cutoff Marks for CS&IT in GATE

IMPORTANCE OF GATE

GATE: Graduate Aptitude Test in Engineering

- Is one of the national level entrance examination
- It is conducted jointly by Institute of Science (IISc), Bangalore & one of the (7 old) IITs on behalf of the NCB-GATE, Department of Higher Education, MHRD, Government of India
- The exam is a gateway to get admission and/or financial assistance to master's programs and direct Doctoral programs in Engineering/Technology/Architecture and Doctoral programs in relevant branches of Science, in the institutions supported by the MHRD and other Government agencies
- In 2020 it was IITD
- It is IITB which is going to conduct the GATE - 2021

BENEFITS OF GATE

- PSU's (Public Sector Units)
  - One of the Highest paid Government Job
  - Stable
  - Maharatan, Navaratan, Miniratan (SAIL, GAIL , BHEL, ONGC etc.,.)
  - 30 to 40 PSU directly recruiting from GATE
  - More opportunities for NON-CSE students
  - For CSE students (BAARC, ISRO, PSPCL, NTPC, GAIL, DRDO, ONGC, etc.,) (Cutoff varies from company to company)

BENEFITS OF GATE

- M.Tech or MS
  - 2 Years Course for M.Tech and 2-3 Years for MS in india (Research oriented)
  - M.Tech needs High GATE score whereas MS requires less GATE score
  - Government will pay for you through stipend
  - High remuneration in corporates R&D (through placements) if you are into IITs or NITs

BENEFITS OF GATE

- Sponsorship programs
  - DRDO, CSIR, ISRO research labs
- Research oriented projects
  - DRDO etc.,
- JRF (Junior Research Fellowships)
  - CSIR research labs
- Integrated Ph.D's (5 Years) in some of the IITs
- Strengthens your resume
- Free Lancing on GATE and competitive examinations with high package

WHEN TO START PREPARATION

- There is no need to look at the panchangam and good time for good deeds…you can start from the first year itself (but take the flavor of engineering in the first year by just concentrating more on mathematics only)
  - 1st year – Mathematics
  - 2nd Year – DMS, OS, CN, COA

GENERAL TIPS FOR GATE

- Be motivated on the GATE Examination all the time
- Be cool and stress less during the day of GATE Exam
- Presence of mind is very important on the day of examination
- Check your submitted answers thoroughly before leaving the exam hall
- You will get only 2.7 Minutes for each question (65 questions in 180 minutes), but there are few questions which can be answered in less than/ greater than 2.7 minutes
- Be careful in answering the MCQ's as they have –ve marking
- Be thorough in the short cuts if any
- Plan for how many marks you want (NIT's or IITs or old IITs etc.,)

GENERAL TIPS FOR GATE

- Take Mock Tests (subject wise or entire GATE level), analyse your results
  - Very less mistakes in the final examinations
- Select subjects of your interest
  - Start with Important topics
  - Understand the basics thoroughly in each subject and solve maximum number of problems if any
  - Maintain short notes on each and every subject you study (to aid in revision and fast track preparation at the last minute)
  - Solve the previous GATE questions on those subjects
  - Revision…revision…revision (for perfection)

SCHEDULE OF GATE - 2021

Events	Dates (Tentative)
Online Application form opens	1st week of September 2020
Closing of submission of application form	4th week of September 2020
Last date for requesting change of examination city (an additional fee will be applicable)	3rd week of November 2020
Admit Card availability	1st week of January 2021
GATE 2021 Examination	1st week of February 2021
Announcement of Result	3rd week of March 2021

GATE 2021 EXAM PATTERN

- **Mode:** The exam will be conducted in online **(CBT)** mode
- **Papers:** The exam will be conducted for **25 subjects** (referred to as "papers")
- **Type of Questions:** The questions will of Multiple Choice Questions **(MCQ)** & Numerical Answer Type **(NAT)**
- **Duration of Exam:** The exam will be of total **3 hours**
- **Maximum marks:** The question paper will be **100 marks**

GATE 2021 EXAM PATTERN

- **No. of Questions:** The question paper will consist of **65 questions**

- **No. of Sections:** 1. Aptitude(15%) 2. Mathematics (15%) 3. Subject Specific Questions (70%)

- **Marking Scheme:** For MCQs and NATs, various questions will be of 1 or 2 marks. In MCQs of 1 mark, 1/3 marks will be deducted for wrong responses. For MCQs of 2 mark, 2/3 marks will be deducted for incorrect answers.

- **Note:** There will be **NO negative marking** for a wrong answer in NAT questions and there is no sectional time limit

GATE 2021 EXPECTED CUTOFF MARKS

Streams	General	OBC	SC/ST/PH
Computer Science	**25**	**22.30**	**16.23**
Electronics and Communication	25	25.5	16.50
Civil Engineering	26.70	18.1	24.20
Mechanical Engineering	34.6	31.5	23.4
Chemical Engineering	37.1	34	25.0
Petroleum Engineering	39.5	35.2	26.3

GATE CUTOFF MARKS FOR CS/IT

Year	General	OBC	SC/ST/PH
2020	28.5	25.6	19.0
2019	29.5	26.6	19.7
2018	25	22.5	16.6
2017	25	22.5	16.6
2016	25	22.5	16.6
2015	25	22.5	16.67
2014	25	22.25	16.67

PART – 2
INFORMATION RELATED TO DATA STRUCTURES

- Agenda:
  - Weightage of Data Structures in GATE
  - Syllabus of Data Structures in GATE
  - Best Books on Data Structures for GATE
  - Distribution of Marks in each and every topic of Data Structures

Information related to Data Structures

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Weightage of Data Structures in GATE

WEIGHTAGE OF DS IN GATE

YEAR	MARKS
2018	9
2017	14
2016	11
2015	18
2014	10

On an average we can expect 5-10 questions which comes to an average of 10 – 18 Marks from Programming and DS

WEIGHTAGE OF DS IN GATE

- **Don't Worry –**

- They will not ask too much complex questions from Programming and DS

- Average level questions – where we need to apply the concepts

Syllabus of Data Structures for GATE

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SYLLABUS OF DATA STRUCTURES FOR GATE

Topic	Concepts	Marks
Stack	Basics, Expression Evaluation, Representation, Recursion	1-2 marks
Queue	Basics, Implementation	0-1 marks
Linkedlist	Basics, Coding Questions	2-4 marks
Tree	Binary Trees, Binary Search Trees, AVL, Complete Binary Tree, Heap	3-4 marks
Graphs	Implementation, BFS, DFS	1-2 marks
Hashing	Idea, Mod Functions, Collision Resolution	1-2 marks

Best Books on Data Structures for GATE

BEST BOOK FOR DATA STRUCTURES

- TITLE:
  - Introduction to Algorithms
- EDITION:
  - Third Edition
- AUTHORS:
  - Thomas H Cormen
- PROS and CONS:
  - Only theory and no programming

BEST BOOK FOR DATA STRUCTURES

- TITLE:
  - The C Programming Language
- EDITION:
  - Second Edition
- AUTHORS:
  - Brain W Kernighan
  - Dennis Ritchie
- PROS and CONS:
  - Best for programming in C Language

PART – 3
INTRODUCTION TO DATA STRUCTURES

- Agenda:
  - Data Structures
    - Definition
    - Classification of Data Structures
    - Linear Data Structures
    - Non-Linear Data Structures
    - The need for Data Structures
    - Efficiency

Data Structures

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IMPORTANCE OF DATA STRUCTURES

"I will, in fact, claim that the difference between a bad programmer and a good one is whether he considers his code or his data structures more important. Bad programmers worry about the code. Good programmers worry about data structures and their relationships."

Linus Torvalds, 2006

Introduction to Data Structures

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DATA STRUCTURE

- Data structure usually refers to an organization for data in main memory

- File structure is an organization for data on peripheral storage, such as a disk drive

CLASSIFICATION OF DATA STRUCTURES

- Data structures can be classified into two types
  - Linear Data Structures
  - Non-Linear Data Structures

LINEAR DATA STRUCTURES

- **LINEAR DATA STRUCTURES:**
  - In linear data structure the elements
    - are stored in sequential order
    - traverses the data elements sequentially in which only one data element can directly be reached

LINEAR DATA STRUCTURES

- The linear data structures are
  - **Array:** Array is a collection of data of same data type stored consecutive memory location and is referred by common name
  - **Linked list:** Linked list is a collection of data of same data type but the data items need not be stored on consecutive memory locations.
  - **Stack:** A stack is a Last-In-First-Out linear data structure in which insertion and deletion takes place at only one end called the top of the stack.
  - **Queue:** A Queue is a First in First-Out Linear data structure in which insertions takes place one end called the rear and the deletions takes place at one end called the Front.

NON-LINEAR DATA STRUCTURES

- **NON-LINEAR DATA STRUCTURE:**

  - In Non – Linear data structure the elements
    - The data items are not arranged in a sequential structure
    - The data items are stored based on the hierarchical relationship among the data
    - Every data item is attached to several other data items in a way that is specific for reflecting relationships

NON-LINEAR DATA STRUCTURES

- The following are some of the Non-Linear data structure
  - **Trees:** Trees are used to represent data that has some hierarchical relationship among the data elements.
  - **Graph:** Graph is used to represent data that has relationship between pair of elements not necessarily hierarchical in nature. For example electrical and communication networks, airline routes, flow chart, graphs

THE NEED FOR DATA STRUCTURES

- More powerful computers ⇒ More complex applications ⇒ More complex applications demand more calculations ⇒ More efficient programs to be written ⇒ Needs well organization of the data (Any organization for a collection of records can be searched, processed in any order, or modified) ⇒ Selection of well suited data structure for the application

- The choice of data structure and algorithm can make the difference between a program running in a few seconds or many days

- **Example:** Simple unordered array of records vs Ordered array of records

EFFICIENCY

- Each data structure has costs and benefits
- Rarely is one data structure better than another in all situations
- A data structure requires:
  - space for each data item it stores
  - time to perform each basic operation

EFFICIENCY

- Each problem has constraints on available space and time
- A solution is said to be efficient if it solves the problem within its resource constraints
- The cost of a solution is the amount of resources that the solution consumes
- Only after a careful analysis of problem characteristics we can know the best data structure for the task

SELECTING A DATA STRUCTURE

Select a data structure as follows:

1. Analyze the problem to determine the resource constraints a solution must meet.

2. Determine the basic operations that must be supported. Quantify the resource constraints (Time & Space) for each operation.

3. Select the data structure that best meets these requirements.

End of
Day – 1 Lecture Notes
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