



ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

Scheme of Examination & Syllabus 2026-27

MASTER OF COMPUTER APPLICATIONS

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26MCA101T	Problem Solving through Programming	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
This course is intended <ul style="list-style-type: none">To develop logical thinking and problem-solving skills using fundamental programming concepts.To understand and apply algorithms, flowcharts, and basic programming constructs for solving computational problems.To design, implement, and test simple programs using a high-level programming language.	Students will be able to <ol style="list-style-type: none">Apply control structures appropriately to solve problemsConstruct code involving arrays and string conceptsAbility to understand functional code organizationImplement code involving structures and union conceptsDemonstrate file handling through programs

Unit I: C CONTROL STRUCTURES

[9 Hrs]

History of C - Memory concepts - Constants, variables, data types and keywords - Instructions and operators - Decision control structure - if... else construct - Loop control structure - For loop - While loop - Case control structure - Switch case - Break - Continue

Unit II: ARRAYS AND STRINGS

[9 Hrs]

Pointers to arrays - Passing Arrays to functions - Array of pointers - Three-dimensional arrays Strings - Characters - Character handling library - String I/O - String conversion – String comparison - String search - Pointers and strings - 2D array of strings - Array of pointers to strings - Passing strings to functions

Unit III: FUNCTIONS AND POINTERS

[9 Hrs]

Functions - Library functions - Function definitions - Prototype - Scope - Storage classes -Call by value - Pointers variable - Definition and initialization - Pointer operators - Calling function by reference - const qualifier with pointers – size of operator - Pointer arithmetic - Pointers to functions - Recursion

Unit IV: STRUCTURES, UNIONS, ENUMS AND BIT OPERATIONS

[9 Hrs]

Structure definitions - Initializing structures - Accessing structure members - Array of structures - Pointers to structures - Using structures with functions – Self-referential structures - typedef - Unions - Bitwise operators - Bit fields - Enumeration constants

Unit V: CONSOLE I/O, FILE HANDLING AND PREPROCESSORS

[9 Hrs]

Types of I/O - Formatted and unformatted console I/O functions - Printing integers, floats and strings - Conversion specifiers - Reading formatted input - Command line arguments - File processing - Data hierarchy - File and streams - File operations - Sequential-Access file - Random Access file - Error handling - Stderr - Exit A case study - Preprocessors - symbolic constants and macros - File inclusion - Conditional compilation

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	C: How to Program	P. J. Deitel, H. M. Deitel	9 th	on Education prenticeHall
2	Programming with C	Byron Gottfried	4 th	McGraw Hill

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	The Complete Reference C	Herbert Schildt	4 th	McGraw Hill
2	The C Programming Language	Brian W. Kernighan, Dennis M. Ritchie	2 nd	Pearson Education
3	Let us C	Yashavant Kanetkar	17 th	BPB

Online Resources

1	https://github.com/pdeitel/CHowToProgram9e
2	https://www.programiz.com/c-programming

		July 2026	1.0	Applicable for 2026-27
Chairman - BoS	Dean – Academics	Date of Release	Version	



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MASTER OF COMPUTER APPLICATIONS

SEMESTER I

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26MCA101P	Problem Solving through Programming Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none"> To develop logical thinking and problem-solving skills using fundamental programming concepts. To understand and apply algorithms, flowcharts, and basic programming constructs for solving computational problems. To design, implement, and test simple programs using a high-level programming language. 	<p>Students will be able to</p> <ol style="list-style-type: none"> Apply control structures appropriately to solve problems Construct code involving arrays and string concepts Ability to understand functional code organization Implement code involving structures and union concepts Demonstrate file handling through programs

Expt. No. Experiments based on

- 1 Implement decision control structure - if... else, nested if... else
- 2 Implement loop and case control structure
- 3 Implement array concept - single and 2D
- 4 Implement string manipulations - library and user defined
- 5 Implement function concept
- 6 Implement pointer concept using function
- 7 Implement concept of structures and union to understand difference between them
- 8 Implement bit wise operations
- 9 Implement different file related operations
- 10 Micro Project

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	C: How to Program	P. J. Deitel, H. M. Deitel	9 th	Prentice Hall
2	Programming with C	Byron Gottfried	4 th	McGraw Hill

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Sr. No.	Title	Authors	Edition	Publisher
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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26MCA102T	Digital Logic Fundamentals	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none">To understand the basic concepts of digital systems, number systems, and logic gates.To analyze and design combinational logic circuits using Boolean algebra and logic minimization techniques.To understand the working principles of sequential circuits and basic digital components used in computer systems.	<p>Students will be able to</p> <ol style="list-style-type: none">Interpret different number system, binary codes and digital logic elementsAcquaint with elementary postulates of Boolean algebra and methods for simplifying Boolean expressionsIllustrate the procedures for the analysis and design of combinational circuitsDemonstrate the procedures for the analysis and design of sequential circuitsAnalyze and design digital circuits using various types of registers and counters

Unit I: NUMBER SYSTEM AND BINARY CODING

[9 Hrs]

Number system representation: Decimal number system- Binary number system- octal number system- hexadecimal number system- number system representation- number system conversion-signed number representation- complement system: 1's complement – 2's complement- 9's complement – 10's complement- Binary arithmetic operations: addition- subtraction-multiplication- division- Coding schemes: BCD, Gray code and ASCII code.

Unit II: BOOLEAN LOGICS AND LOGIC GATES

[9 Hrs]

Introduction - Boolean Logics and Logic Gates -Universal Gates and properties- Boolean Algebra Theorems - Boolean Function - Minterms- Maxterms- Karnaugh Map (K-Map)- Sum of Products (SOP) and Product of Sums (POS). Don't Care Conditions.

Unit III: COMBINATIONAL CIRCUITS

[9 Hrs]

Introduction- Combinational logic- Half Adder – Full adder- Half subtractor-Binary adder -Binary adder subtractor- BCD adder- Binary multiplier- Encoder- Decoder- Multiplexer- Demultiplexer-BCD to seven segment display.

Unit IV: SEQUENTIAL CIRCUITS

[9 Hrs]

Sequential logic- Introduction-Latches- Clock - Types of Clock – positive, Negative edge triggered - Flip-Flops (with Timing Diagram) - SR Flip Flop – D Flip Flop – JK Flip Flop -Edge Triggered Flip Flops- Master-Slave JK Flip-Flop-Timing diagram.

Unit V: REGISTERS AND COUNTERS

[9 Hrs]

Introduction to Register and Counter – Shift registers – Serial Transfer – Modes of operations-Serial in Serial Out (SISO) -Serial in Parallel out (SIPO) – Parallel in Serial Out (PISO)- Parallel in Parallel out (PIPO)- Bidirectional Shift Register -Synchronous Counter - Asynchronous Counters - Binary Counters - Up/Down counter -BCD counter.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Digital Principles and Applications	Donald P. Leach, Albert Paul Malvino, Goutam Saha	8th	Tata McGraw-Hill
2	Logic and Computer Design Fundamentals	Morris M. Mano, Charles R. Kime	2nd	Pearson Education

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Digital Computer Fundamentals	Thomas C. Bartee	6th	Tata McGraw-Hill
2	Computer Architecture and Organization	William Stallings	8th	PHI
3	Computer Organization and Design	David A. Patterson, John L. Hennessey	5th	Morgan Kaufmann / Elsevier

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
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26MCA103T	Probability and Statistics	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none">To understand the fundamental concepts of probability and statistical methods used in data analysis.To apply probability distributions and statistical techniques for solving real-world problems.To develop the ability to analyze, interpret, and draw conclusions from quantitative data using statistical tools.	<p>Students will be able to</p> <ol style="list-style-type: none">Summarize and present the data using exploratory data analysisEstablish the relationship between the frequency distributions(data) and distribution functions (Model) and important characteristicsThe sampling distributions and their applications in hypothesis testingIdentify the relationship between the variables and modeling the sameApply interval estimation techniques to construct confidence intervals for population parameters

Unit I: EXPLORATORY DATA ANALYSIS

[9 Hrs]

Definition of Statistics, applications, data types and measurements, graphical representation of data using histogram, line diagram, bar diagram, time series plots; measures of central tendency and dispersion; coefficient of skewness and kurtosis and their practical importance.

Unit II: PROBABILITY AND RANDOM VARIABLES

[9 Hrs]

Random experiment, sample space and events. Definitions of probability, addition and multiplication rules of probability, conditional probability and some numerical examples; Random variables: Definition, types of random variables, pmf and pdf of random variables; Mathematical expectation: mean, variance, covariance, mgf and cgf of a random variable(s); Probability distributions: Binomial, Poisson and Normal distributions with their important characteristics

Unit III: SAMPLING DISTRIBUTIONS

[9 Hrs]

Concepts of population, sample, parameter, statistic, and sampling distribution of a statistics; Sampling distribution of standard statistics like, sample mean, variance, proportions etc. t, F and Chi- square distributions with statistical properties

Unit IV: TESTING OF HYPOTHESIS

[9 Hrs]

The fundamentals of statistical hypothesis testing, including simple and composite hypotheses, formulation of null and alternative hypotheses, statistical tests, critical regions, and the concepts of Type I and Type II errors. The testing of hypotheses using t-test, F-test, and Chi-square test for large sample cases.

Unit V: Interval Estimation and Confidence Intervals

[9 Hrs]

The concept of interval estimation and the construction of confidence intervals, confidence interval estimation for standard population parameters such as mean, variance, difference of means, and proportions, considering only large sample cases.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Fundamentals of Mathematical Statistics	Gupta S.C., Kapoor V.K.	-	Sultan Chand & Sons
2	Applied Statistics and Probability for Engineers	Douglas C. Montgomery, George C. Runger	-	Wiley (Student Edition)

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Mathematical Statistics	Freund J.E.	-	Prentice Hall
2	Statistics for Managers Using Microsoft Excel	Levine D.M., Berenson L.M., Stephen D.	2nd	PHI, New Delhi

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26MCA104T	Operating Systems	3	-	-	3	CA	ESE	Total
						40	60	100

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none"> To understand the fundamental concepts, structure, and functions of operating systems. To study and analyze process management, memory management, file systems, and scheduling techniques. To develop an understanding of resource management and synchronization mechanisms in operating systems. 	<p>Students will be able to</p> <ol style="list-style-type: none"> Demonstrate the fundamental principles of operating system, system structure, system calls, programs and system boot Evaluate the process scheduling, Thread scheduling, scheduling criteria, critical section problems to calculate the processing time effectively Implement deadlock system and multiple memory management strategies Apply the appropriate file system for overall management of any operating system Analyze the file management concepts using LINUX

Unit I: FUNDAMENTALS of OS

[9 Hrs]

Operating system definition, Computer system organization, structure, architecture and operations, process and storage management, Protection and security, Distributed systems, Special purpose systems, Computing Environments, Linux Operating Systems. System structure: operating system services, user interface, system calls, system programs, OS design, Implementation and structure, virtual machines, system boot.

Unit II: PROCESS SCHEDULING

[9 Hrs]

Process concepts, scheduling, operations on processes, Inter process communication, Examples of IPC systems, Communication in client server systems, Threads, Multi-threading models, threading issues, Basic concepts, scheduling criteria, scheduling algorithms, Thread scheduling, Multiple-processor scheduling.

Unit III: PROCESS COORDINATION

[9 Hrs]

Critical section problems, Peterson solution, Introduction to semaphores, classic problems of synchronization, Monitors, synchronization examples, atomic transaction, System model, deadlock characterization, methods for handling deadlock, deadlock prevention, avoidance, detection and recovery from deadlock.

Unit IV: MEMORY MANAGEMENT

[9 Hrs]

Memory Management Strategies: Background, swapping, Memory allocation, Paging, Structure of the page table, Segmentation. Virtual Memory Management: Demand paging, Page replacement, allocation of frames, thrashing, memory mapped files, Allocating kernel memory. Memory management concepts can be demonstrated using Linux.

Unit V: FILE MANAGEMENT

[9 Hrs]

File concepts, access methods, directory and disk structure, File system mounting, File sharing, Protection, directory implementation, allocation methods, free-space management. I/O Systems, I/O hardware, Application I/O Interface, Kernel I/O subsystem, Transforming I/O requests to hardware operations.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Operating System Concepts	Silberschatz, P.B. Galvin, G. Gagne	9th	Wiley-India
2	Linux System Programming	Robert Love	-	O'Reilly

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Operating Systems: Internals and Design Principles	William Stallings	7th	Pearson
2	Modern Operating Systems	Andrew S. Tanenbaum, Herbert Bos	4th	Pearson

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
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26MCA104P	Operating Systems Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none"> To provide hands-on experience with operating system concepts such as process management, memory management, and file handling. To implement basic operating system algorithms related to CPU scheduling, deadlock handling, and memory allocation. To develop practical skills in using system calls, shell commands, and programming tools in an operating system environment. 	<p>Students will be able to</p> <ol style="list-style-type: none"> OS fundamentals, structure, and basic Linux operations. Analyze process scheduling and multithreading techniques. Apply synchronization and deadlock handling methods. Illustrate memory management and page replacement strategies. Implement file systems, disk scheduling, and I/O management.

Expt. No. Experiments based on

- Study and execution of basic **Linux commands** for file, directory, and process management
- Program to demonstrate **system calls** (fork(), exec(), wait(), exit()) and creation of parent-child processes.
- Simulation of **CPU Scheduling Algorithms** – FCFS and SJF (Non-preemptive).
- Implementation of **Round Robin Scheduling** with calculation of waiting time and turnaround time.
- Implementation of **Producer-Consumer Problem** using semaphores.
- Simulation of **Deadlock Detection Algorithm** (Banker's Algorithm or detection method).
- Simulation of **Memory Allocation Techniques** – First Fit and Best Fit.
- Implementation of **Page Replacement Algorithms** – FIFO and LRU.
- Program to perform **file operations using system calls** (open(), read(), write(), close()).
- Simulation of **Disk Scheduling Algorithms** – FCFS and SCAN.

Text Books

Sr. No.	Title	Authors	Edition	Publisher
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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26MCA105P	Web Programming Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended <ul style="list-style-type: none">To develop practical skills in designing and developing static and dynamic web pages using web technologies.To implement client-side and server-side programming concepts for interactive web applications.To understand and apply web development tools, frameworks, and debugging techniques for building functional websites.	Students will be able to <ol style="list-style-type: none">Apply control structures appropriately to solve problemsConstruct code involving arrays and string conceptsAbility to understand functional code organizationImplement code involving structures and union conceptsDemonstrate file handling through programs

Expt. No. Experiments based on

- 1 HTML Elements and Attributes
- 2 Links, Images, and Multimedia
- 3 Tables and Forms
- 4 Semantic HTML & Advanced Concepts
- 5 CSS element, Selectors and Properties
- 6 CSS Box Model and Text Styling
- 7 CSS Layouts and Positioning
- 8 Advanced CSS Techniques
- 9 Micro Project

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	HTML and CSS: Design and Build Websites	Jon Duckett	1st	Wiley
2	Learning Web Design	Jennifer Niederst Robbins	5th	O'Reilly Media

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Beginning HTML and CSS	Rob Larsen	1st	Wiley
2	HTML5 and CSS3 Illustrated	Sasha Vodnik	2 nd	Course Technology (Cengage)

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26MCA106T	Computer Architecture and Organization	3	-	-	3	40	60	100

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none"> To understand the design of the various functional units and components of computers. To make the students understand the basic operations involved in execution of an instruction. To Explain the basic concept of interrupts and their usage to implement I/O control and data transfers. To explain the function of each element of a memory hierarchy. 	<p>Students will be able to</p> <ol style="list-style-type: none"> Summarize the organization and operation of digital computers. Apply knowledge of processor instruction sets and its execution. Demonstrate computer arithmetic operations on integer and floating-point numbers. Describe the organization of memory system. Explain concepts of I/O organization and pipelining of a processor.

Unit I: Basic structure of computer

[9Hrs]

Functional Units, Architecture of a small accumulator-based CPU, A typical CPU with general register organization, Instruction execution cycle, Addressing modes, Instruction Format.

Processing Unit: Execution of a complete instruction, Sequencing of control Signals, types of Buses, Single, Two, multiple bus structure

Unit II: Computer Arithmetic

[9Hrs]

Binary Addition, Addition and subtraction, Multiplication of unsigned binary integers, Booth's algorithm for Two's complement multiplication unsigned, Unsigned binary division, IEEE Floating-Point representation, Floating Point arithmetic.

Unit III: Control Unit

[9Hrs]

Control Unit operation: Introduction, Micro-operations, Control of the Processor, Hardwired implementation, **Micro programmed control:** Microinstruction formats, Micro programmed control unit, Functioning of microprogrammed control unit, Microinstruction sequencing techniques.

Unit IV: The Memory System

[9Hrs]

Internal organization of memory chip, Static memories, Dynamic RAMs, Read-Only Memories, Memory interleaving, Cache Memory, Mapping techniques, Virtual memory, Memory Management requirements, I/O modules, Programmed I/O, Interrupt-Driven I/O, DMA.

Unit V: Pipelining and parallel Processing

[9Hrs]

Pipelining: Introduction, Pipeline organization, Pipelining issues, Memory delays, Branch delays, Parallel Processing, Types of parallel processor systems, Vector processing **Processors:** RISC & CISC Processors, Pentium processor, superscalar processor

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Computer Organization	V. Carl Hamacher	4th	Mc GrawHill
2	Computer Organization and Design	David A. Patterson & John L. Hennessy Morg.	4th	Morgan Publication

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Computer Architecture & Organization	William Stallings	9th	Pearson
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						CA	ESE	Total
26MCA107P	Software Lab-1 (Python Basics)	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none">To develop basic programming skills using Python for solving simple computational problems.To understand and implement fundamental Python constructs such as variables, data types, control structures, and functions.To gain hands-on experience in writing, testing, and debugging Python programs.	<p>Students will be able to</p> <ol style="list-style-type: none">Apply conditional and looping statements to solve basic programming problems in Python.Perform operations on strings, lists, tuples, sets, and dictionaries.Develop modular Python programs using functions and recursion.Implement file handling and exception handling techniques in Python programs.Design and implement a simple micro project using core Python concepts.

Expt. No. Experiments based on

- 1 Python-Conditional Statements
- 2 Looping Statements
- 3 Strings and String Operations
- 4 Lists and List Operations
- 5 Tuples and Sets
- 6 Dictionary and Dictionary Operations
- 7 Functions & Recursion
- 8 File Handling
- 9 Exception Handling
- 10 Micro Project

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	An Introduction to Python and Computer Programming	Zhang Y.	–	Springer Publications
2	Core Python Application Programming	Wesley J. Chun	3rd	Prentice Hall

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Programming Python	Mark Lutz	–	O'Reilly Media Inc.
2	Programming with Python	T. R. Padmanabhan	–	Springer Publications

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
26MCA108P	Career Development I	-	-	2	1	50	-	50

Course Objectives	Course Outcomes
This course is intended <ul style="list-style-type: none">To develop essential communication, interpersonal, and professional skills required for career growth.To enhance aptitude, logical reasoning, and problem-solving abilities for competitive examinations and placements.To prepare students for professional environments through personality development and interview preparation skills.	Students will be able to <ol style="list-style-type: none">Demonstrate effective communication and interpersonal skills.Apply logical reasoning and aptitude skills for problem solving.Exhibit professional behavior and readiness for interviews and career opportunities.

Unit I

Number System: - Divisibility Test, LCM/HCF Problems, Factorization, Remainder Theorem, Successive Division.

Number Series: - Missing Number Series, Wrong Number series, Letter Series

Analogy (Number, Letter, Word, Non-Verbal analogy)

Key Skills and Abilities, Goal & Interests

[5Hrs]

Unit II

Simple Equations

Percentage: - Percentage to ratio conversion, Successive Percentage, Increase Decrease of Percentage, etc.

Ambition & Knowledge,

[5Hrs]

Unit III

Ratio & Proportion: - Joining of two ratios, Proportion, Mean Proportions, Problems on ages

Partnership Problems

true potential of your Branch of Engineering, Engineering Principle from Human Body

[5Hrs]

Unit IV

Profit Loss: - Concept of Profit loss, Relation between CP SP Profit and Loss, Problems on Profit Loss.

Discount: - Successive Discount, Relation between MP Discount and Selling Price, Problems based on Discount.

Critical Creative & System Thinking, Cornell Note Taking System,

[5Hrs]

Unit V

Simple Interest

Compound Interest

Engineering Habits of mind, need to think Creatively

[5Hrs]

Text Books

S.N	Title	Authors	Edition	Publisher
1	Quantitative Aptitude By R. S. Aggarwal	R.S. Aggarwal	--	S.Chand
2	Quantitative Aptitude	Shripad Deo	--	Allied Publishers Pvt Ltd
3	A Modern Approach to Verbal & Non-Verbal Reasoning	R.S. Aggarwal	--	

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Quantitative Aptitude for CAT	Arun Sharma	---	MC Graw Hill

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