

Syllabus SEM IV

4CS205PC/4DS205PC/4AD205PC/4KE205PCDAT A COMMUNICATION AND NETWORKING

Course Pre-requisite:

Computer and Data Communication Requirements

Course Objectives:

Throughout the course, students will be expected to demonstrate their understanding of Data Communication and Networking by being able to do each of the following:

- Study the basic taxonomy and terminology of the digital communications system, computer networking and enumerate the layers of OSI model and TCP/IP model.
- Acquire knowledge of Application layer paradigms and protocols.
- Study Transport layer design issues, Transport layer services, and protocols.
- Gain core knowledge of Network layer routing protocols and IP addressing.
- Study data link layer concepts, design issues, and protocols.

Course Outcomes (CO's):

On completion of the course, the students will be able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Describe the Transport layer and Transport layer services.
3. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
4. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real-time applications.

Syllabus:

Unit I: Introduction to Network Models (Hours: 07)

Data Communication Components: Basic network types, switching mechanisms, Internet standards. **Layered Architecture:** Overview of the OSI and TCP/IP models, focusing on key functions of each layer.

Unit II: (Hours: 07)

Transmission Media: Guided vs. Unguided media, key characteristics, and real-time application examples. **Switching Techniques:** Circuit, Packet, and Virtual Circuit Switching.

Unit III: Application Layer Protocols - (Hours: 07)

Application Layer Overview: Client-server model, APIs, P2P networking. **Key Protocols:** HTTP, FTP, SMTP, DNS, focusing on their importance in internet communication.

UnitIV:TransportLayerFundamentals-(Hours:07)

Transport Layer Overview: Principles of connectionless and connection-oriented services.**KeyProtocols:**UDP,TCP–Conceptsof reliability, congestion control, flow control.**MultiplexingandDemultiplexing:** Basic mechanisms and their relevance in data transmission.

UnitV:NetworkLayerProtocolsandIPAddressing-(Hours:07)

Network Layer Overview: Services provided by the network layer, datagram vs. virtual circuit approaches.**IPAddressing:**IPv4,IPv6,NAT,DHCP,andICMP functionalities. **Routing:** Introduction to routing algorithms (Distance Vector and Link-State), basic concept of forwarding.

UnitVI:DataLinkLayerandMACProtocols-(Hours:07)

DataLinkLayerServices:Framing,error detection(CRC,Checksum),and correction techniques.**MACLayer:**Conceptsof LAN addressing,ARP,CSMA/CD,andPPP.
LayerProtocols:HDLCan dPoint-to-PointProtocol.

Link

TextBooks:

1. Behrouz A. Forouzan: Data Communication and Networking, (5/e) (TMH)
2. James F. Kurose & K. W. Ross: Computer Networking, Pearson Education (LPE)

ReferenceBooks:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education
2. William L. Schweber: Data Communication, McGraw Hill
3. Douglas E. Comer: Computer Networks & Internet, Addison Wesley.
4. Andrew S. Tanenbaum: Computer Networks, PHI (5E)
5. Leon Garcia & W. J. Jaja: Communication Networks, TMH

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4CS206PC/4DS206PC/4AD206PC/4KE206PC OPERATING SYSTEM

CoursePre-requisite:

Discrete Structures, Data Structure, Any programming Language

CourseObjectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems.
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

CourseOutcomes:(ExpectedOutcome):

On completion of the course, the students will be able to:

- Explain memory management issues like external fragmentation, internal fragmentation.
- Illustrate multithreading and its significance.
- List various protection and security mechanisms of OS.
- Analyze and solve the scheduling algorithms.
- Analyze the deadlock situation and resolve it.
- Compare various types of operating systems

Syllabus:

Unit I: Introduction to OS (Hours: 07)

Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

Unit II: Process Scheduling (Hours: 07)

Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling

Unit III: Process Synchronization (Hours: 07)

Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit IV: Memory Management (Hours: 07)

Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing

Unit V: File System (Hours: 07)

File-System Interface; Directory Structure, File-System Mounting, File Sharing & Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Unit VI: I/O System (Hours: 07)

I/O Systems: Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Book:

Avi Silberschatz, P.B. Galvin, G. Gagne: "Operating System Concepts" (9/e) John-Wiley & Sons.

ReferenceBooks:

1. A.S.Tanenbaum“ModernOperatingSystems”PearsonEducation.
2. WilliamStallings“OperatingSystems”Prentice-Hall.
3. D.M.Dhamdhere“OperatingSystems”TataMcGraw-Hill.
4. P.BalkrishnaPrasad:“OperatingSystems”ScitechPublications(I)Pvt.Ltd.

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4CS207PC/4KE207PC

THEORYOF COMPUTATION**CoursePre-requisites**

- DiscreteMathematics
- DataStructures

CourseObjectives:

- Tounderstandautomatatheoryanditsoperation.
- Tounderstandmathematicalexpressionsforformallanguages.
- Tolearnimplementingthestatemachinesforsolvingreallifeproblems.
- Tostudycomputingmachinesandcomparingdifferenttypesofcomputational models.
- TounderstandthefundamentalsofproblemdecidabilityandUn-Decidability.

CourseOutcomes:(ExpectedOutcome):

Oncompletionofthecourse,thestudentwillbeableto:

1. Toconstructfinitestatemachinestosolveproblemsincomputing.
2. Towriteregularexpressionsfortheformallanguages.
3. Toconstructandapplywelldefinedrulesforparsingtechniquesincompiler.
4. ToconstructandanalyzePushDown,TuringMachineforformallanguages
5. ToexpresstheunderstandingoftheChomskyHierarchy.
6. Toexpresstheunderstandingofthedecidabilityandun-decidabilityproblems.

Syllabus:**UnitI:FiniteStateMachines:(Hours:07)**

Alphabet,String,FormalandNaturalLanguage,Operations,DefinitionandDesignDFA (Deterministic Finite Automata), NFA (Non-Deterministic Finite Automata), Equivalence ofNFAandDFA:ConversionofNFAintoDFA,ConversionofNFAwiththeepsilon movesto NFA,MinimizationOfDFA,DefinitionandConstructionofMooreandMealyMachines, InterconversionbetweenMooreandMealyMachines.MinimizationofFiniteAutomata. (Construction of Minimum Automaton).

UnitII:RegularExpressionandRegularGrammar:(Hours:07)

DefinitionandIdentitiesofRegularExpressions,ConstructionofRegularExpressionof thegivenLanguage,ConstructionofLanguagefromtheRE,ConversionofFAtoREusing Arden's Theorem, Inter-conversionREtoFA, PumpingLemmaforRL, Closure properties

of RLs (proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.

UnitIII:ContextFreeGrammarandLanguages:(Hours:07)

Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.

UnitIV:PushdownAutomata:(Hours:07)

Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion, Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.

UnitV:TuringMachines:(Hours:07)

Formal definition of a Turing Machine, Design of TM, Computable Functions, Church's hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.

UnitVI:DecidabilityandUn-Decidability:(Hours:07)

Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursively enumerable language, Properties of recursive and non-recursive enumerable languages, Post Correspondence Problem, Introduction to Recursive Function Theory.

TextBook

1. Hopcraft H.E. Cullman J: Introduction to Automata Theory, Languages and Computation
2. Peter Linz: An Introduction to Formal Languages and Automata

ReferenceBook

1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. KVNSunitha and NKalyani: Formal Languages and Automata Theory, McGraw Hill, 2010
3. Lewis H.P. and Papadimitriou C.H.: Elements of Theory of Computation
4. Mishra C Chandrashekhara: Theory of Computation
5. C.K. Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. Vivek Kulkarni: Theory of Computation, OUP India, 2013

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4DS207PC/4AD207PC

**PROBABILITY AND
STATISTICS FOR DATA SCIENCE**

Course Objective:

- Understand and apply probability concept.
- Learn foundational concepts and applications of probability theory and common probability distributions.

- Understand and apply measures of central tendency, dispersion, correlation, and regression analysis in statistical analysis.
- Compute and interpret the correlation coefficient.
- Understand the computational details behind certain numerical methods.
- Gain proficiency in interpolation methods and numerical techniques for solving first-order differential equations.

Course Outcomes: (Expected Outcome):

On completion of the course, the students will be able to:

1. Understand about the collection of the data, condensation, and summarization into a compact form.
2. Apply probability axioms, analyzed distributions, calculate conditional probabilities, and understand the central limit theorem.
3. Understand and compute measures of central tendency, dispersion, correlation, and regression for data analysis.
4. Apply numerical methods for curve fitting using least squares, including fitting straight lines and higher-degree curves.
5. Utilize numerical methods such as Newton-Raphson, false position, Gauss elimination, Gauss-Jordan, Gauss-Seidel, and matrix operations for solving equations and eigenvalue computations.
6. Apply interpolation techniques and numerical methods to solve differential equations accurately and efficiently.

Syllabus:

Unit: I (Hours: 07)

Meaning of experiment, random experiment, deterministic and non-deterministic models. Definition of the term: Outcome, sample space (finite and infinite), discrete sample space, Elementary event, Compound event, Complementary event, Favorable event, Equality-likely events, Sure event, Impossible event. Concept of Occurrence of an event, Union, and Intersection of two or more events, Exhaustive events, mutually exclusive events, Representation of sample space and events by Venn diagram, Occurrence of (i) at least one of the given events (ii) all of the events (iii) none of the given events, Example and problem.

Unit: II (Hours: 07)

Axioms of Probability, central limit theorem, conditional probability, Bayes' rule, Bernoulli trials, probability mass function, continuous random variable, probability density function, probability distributions: Binomial distribution, Poisson distribution, normal distribution.

Unit: III (Hours: 07)

Measure of central tendency: Moments, Expectation, dispersion, skewness, kurtosis, expected value of two-dimensional random variable, Linear Correlation, correlation coefficient, rank correlation coefficient, Regression, Line of Regression.

Unit:IV(Hours:07)

Curve fitting by the numerical method: Curve fitting by method of least squares, fitting of straight lines, second degree parabola and more general curves.

Unit:V(Hours:07)

Newton Raphson method, false position method, Gauss elimination, Gauss Jordan, Gauss Seidel, Matrix Inversion by Gauss Jordan method, Eigen value of a matrix by power method.

Unit:VI(Hours:07)

Interpolation: Forward Difference, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation.
Numerical Solution of First order differential equation: Picard's method, Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method of fourth order.

Textbook:

1. Agarwal, B.I. (2047). Programmed Statistics, Third Edition, New Age International Publisher, New Delhi.
2. S.S. Shastri. Introductory Methods of Numerical Methods, PHI, Vol 2.

Reference Book:

1. Gupta S.C. and Kapoor V.K. (2019) Fundamental of Mathematical Statistics.
2. Numerical Methods for Scientific and Engineering Computation' by M.K. Jain, S.R.K. Iyengar, R.K. Jain
3. Myer, P.I. (1970): Introductory Probability and Statistical Application, Oxford CIBH Publishing, New Delhi.

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**4CS208PC/4DS208PC/4AD208PC/4KE208PCDA
TACOMMUNICATIONS NETWORKING LAB**

Course Pre-requisite:

Computer and Data Communication Requirements

Course Objectives:

- To understand the working principle of various communication protocols
- To understand and analyze the signal flow in a digital communications system.
- To analyze error performance of a digital communications system in presence of noise and other interferences.
- To evaluate the errors using various error detection and correction techniques.
- To understand network based protocols in data communication and networking.

Course Outcomes:

On completion of the course, the students will be able to

1. Analyze performance of various communication protocols
2. Implement and configure various network protocols.

3. Compare IP Address classes of networks

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi

1. To study various LAN topologies and their creation using network devices, cables and computers.
2. To connect the computers in Local Area Network.
3. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
4. Write a program of bit stuffing used by Data Link Layer
5. Write a program to implement CRC (Cyclic Redundancy Check)
6. Write a program to implement Checksum
7. Write a program to implement Sliding window
8. Configure Internet connection and use IP-Config, PING/Tracer and Netstat utilities to debug the network issues.
9. Configuration of TCP/IP Protocols in Windows and Linux.
10. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
11. Write a C Program to determine if the IP Address is in Class A, B, C, D, or E
12. Write a C Program to translate Dotted Decimal IP Address into 32 Bit Address.
13. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration)

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**4CS20GPC/4DS20GPC/4AD20GPC/4KE20GPC
OPERATING SYSTEM LAB**

Course Pre-requisite:

Basic computer programming

Course Objectives:

- To make students aware of the kernel and shell structure of the operating systems.
- To make students aware of the purpose, structure and functions of operating systems
- To equip students with understanding of the various scheduling algorithms in OS.
- To make students aware of understanding of memory management in different OS.

Course Outcomes:

On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multi-threading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi

1. To study Linux Operating System along with its installation.

2. To Study and Execute basic file commands and process related open source Ubuntu commands
 - a. Command to view all executing, block and suspended process.
 - b. Command to check and change the priority of process CPU utilization for executing processes.
 - c. Commands to check for child process, sub-processes, process tree, abort C end process and all other basic commands related to processes
3. Write a program for multi-threading using C.
4. To simulate First Come First Serve, Shortest Job First process scheduling algorithm
5. To simulate Shortest Job First process scheduling algorithm
6. To simulate Pre-emptive Shortest Job First process scheduling algorithm
7. To implement Round Robin Process scheduling Algorithm
8. To implement Priority Based Process scheduling Algorithm
9. To implement and analyze multi-level queue scheduling algorithm
10. To implement the following file allocation strategies.
11. To simulate paging technique of memory management.
12. To implement the FIFO page replacement policy
13. To implement the LRU page replacement policy
14. To implement the optimal page replacement policy
15. To simulate producer-consumer problem using semaphores.
16. To implement Dining-Philosophers problem to deal with concurrency control mechanism.
17. To implement contiguous memory allocation strategies to detect fragmentation using: First Fit, Best Fit and Worst Fit.
18. To implement FCFS Disk Scheduling algorithm
19. To implement SCAN Disk Scheduling algorithm
20. To implement C-SCAN Disk Scheduling algorithm
21. To simulate Banker's algorithm for deadlock avoidance
22. To implement following memory management techniques
23. Implement MV and MF where memory block size is 100 for 5 processes. Enter no. of blocks for each process and calculate internal fragmentation.
24. To simulate LRU page replacement algorithms
25. To simulate the single level directory file organization techniques.
26. To simulate banker's algorithm for Dead Lock Avoidance (Banker's Algorithm)

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4CS306VS/4DS306VS/4AD306VS/4KE306VS

Computing Skill#1 LAB (VSEC-III)

(Based on technology like-Python/Django etc. to be decided by Individual Dept. of respective College)

Course Prerequisite:

Basic knowledge of any Programming Language

Course Objectives:

- To be able to program design with functions using Python.
- To understand data and information processing techniques.
- To understand to Design a program to solve the problems.
- To be able to access database using python programming.

- Tobeabletodesignwebapplicationsusingpythonprogramming.

Course Outcomes:

On completion of the course, the students will be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which a function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
6. 2017"
7. Write a program to create, append, and remove lists in python.
8. Write a program to create, concatenate and print a string and access sub-string from a given string.
9. Write a program to demonstrate working with tuples in python.
10. Write a program to demonstrate working with dictionaries in python.
11. Write a python program to find largest of three numbers.
12. Write a python program in which a function (with single string parameter) is defined and calling that function prints the string parameters given to function.
13. Write a python program in which a class is defined, then create object of that class and call simple print function defined in class.
14. Write a Python script that prints prime numbers less than 20.
15. Write a python program to find factorial of a number using Recursion.
16. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
17. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
18. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
19. Write a Python class to convert an integer to a Roman numeral.
20. Write a Python class to implement $\text{pow}(x, n)$
21. Write a Python class to reverse a string word by word.
22. Accessing and working with databases using Python.
23. Create data frame from .csv files and operations on it.
24. Plotting various graphs using Python.
25. Developing basic GUI using Python.
26. Developing web applications using Django framework or Flask

Reference Books:

1. "Core Python Programming", R. Nageswara Rao, dreamtechpress.

2. “Python Programming A Modular Approach With Graphics, Database, Mobile and Web Applications”, Sheetal Taneja, Naveen Kumar, Pearson.
3. Python Web Development with Django By Jeff Forcier, Paul Bissex, Wesley J Chun, Addison- Wesley Professional.
4. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning
5. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second Edition,
6. Shroff/O’Reilly Publishers
7. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India
8. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structures and Algorithms in Python”, Wiley
9. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher, Revised and Expanded version (Referred by MIT)

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4CS217EM / 4KE217EM / 4DS217EM / 4AD217EM
SOCIAL SCIENCES & ENGINEERING ECONOMICS

Course Objectives:

By the end of the course, students will:

- Understand the importance of social sciences and economics in engineering.
- Gain knowledge of the Indian Constitution, governance, and policy-making.
- Learn about economic principles, market trends, and financial institutions.
- Examine the impact of science, technology, and economic transformations on society.
- Understand professional ethics and responsibilities with socioeconomic considerations.

Course Outcomes (COs):

On completion of the course, students will be able to:

1. Understand the significance of social sciences and economic principles in engineering.
2. Analyze the role of governance, laws, and policies in shaping society and business environments.
3. Apply economic and market principles to assess financial systems and business trends.

Syllabus:

Unit I: Social Sciences and Governance (7 Hours) [CO1]

Importance of Social Sciences in Engineering, Indian Constitution: Salient features, Fundamental Rights and Duties, Directive Principles of State Policy, Governance in India: Structure of Indian Parliament, Role and Powers of the President, Prime Minister, and Council of Ministers.

Unit II: Society, Science, and Technology (7 Hours) [CO2]

Impact of Science and Technology on Culture and Civilization, Human Society: Structure, community groups, social institutions, Marriage and Family Systems: Types, functions, and modern challenges, Production & Business Organizations: Factors of production, laws of return, types of business entities.

Unit III: Economics and Market Trends (8 Hours) [CO3]

Nature and Scope of Economics: Special significance to engineers, Economic Development: Characteristics of underdevelopment, obstacles to economic growth, vicious circle of poverty. Banking and Financial Systems: Functions of Central and Commercial Banks, GST overview, Market Structures: Perfect and imperfect competition, monopoly, pricing mechanisms.

Textbook:

1. Pyle M. V.: Constitutional Govt. in India, S. Chand and Co.
2. C. N. Shankar Rao: Sociology, S. Chand and Co.

Reference Books:

1. Dewett and Varma J. D.: Elementary Economic Theory, S. Chand and Co.
2. A. N. Agrawal: Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
3. S. K. Mishra: Indian Economy, Its Development Experience. Himalaya Pub. House, Bombay.
4. E. Kuper: Economics of W. R. Development, McGraw Hill Co.,
5. Brij Kishore Sharma.: The Constitution of India, PHI.
6. Mahajan: The Constitution of India, S. Chand, New Delhi.
7. MacLaver and Page: Principle of Sociology.
8. Davis K.: Human Society
9. Datt R. K.: Indian Economy, S. Chand and Comp. New Delhi P. M. Sundharam
10. Dhingra I. C.: Indian Economy

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