विद्युत नियमन आयोग
विविध सेवा, सूचना प्रविधि समूह, तह ७, सूचना प्रविधि अधिकृत पदको
खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

यस पाठ्यक्रमलाई दुई चरणमा विभाजन गरिएको छ:

प्रथम चरण :- लिखित परीक्षा (Written Examination) पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता (Interview) पूर्णाङ्क :- ३०

परीक्षा योजना (Examination Scheme)

१. प्रथम चरणः लिखित परीक्षा (Written Examination) पूर्णाङ्क :- २००

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	खण्ड	परीक्षा प्रणाली	प्रश्न संख्या	अङ्क भार	समय
प्रथम	सामान्य ज्ञान, बौद्धिक परीक्षण तथा विद्युत नियमन सम्बन्धी General Technical Subject	१००	४०	(क)	वस्तुगत बहुवैकल्पिक प्रश्न (MCQs)	५०	१	१ घण्टा ३० मिनेट
				(ख)	वस्तुगत बहुवैकल्पिक प्रश्न (MCQs)	५०	१	
द्वितीय	Technical Subject	१००	४०	(क)	छोटो उत्तर आउने प्रश्न	२	५	३ घण्टा
					लामो उत्तर आउने प्रश्न	४	१०	
				(ख)	छोटो उत्तर आउने प्रश्न	२	५	
					लामो उत्तर आउने प्रश्न	४	१०	

२. द्वितीय चरणः अन्तर्वार्ता (Interview) पूर्णाङ्क :- ३०

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्यः

१. लिखित परीक्षाको माध्यम भाषा नेपाली अथवा अंग्रेजी वा नेपाली र अंग्रेजी दुवै हुन सक्नेछ।

२. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ।

३. लिखित परीक्षामा सोधिने प्रश्न संख्या र अङ्कभार यथासम्भव सम्बन्धित पत्र / विषयमा दिइए अनुसार हुनेछ।

४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन।

५. वस्तुगत बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital Letter) A, B, C, D मा लेख्नुपर्नेछ । सानो अक्षर (Small Letter) a, b, c, d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ।

६. बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन।

७. विषयगत प्रश्नहरूको हकमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिनेछ।

८. विषयगत प्रश्न हुने पत्र/ विषयको प्रत्येक खण्डका प्रश्नका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ।

९. यस पाठ्यक्रम योजना अन्तर्गतका प्रश्न/ विषय विषयवस्तुमा जुनसुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेको कानुन, ऐन, नियम, विनियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।

१०. प्रथम चरणको परीक्षाबाट छनौट भएका उमेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ।

११. पाठ्यक्रम स्वीकृत मिति : २०८२/०१/०८

विविध सेवा, सूचना प्रविधि समूह, तह ७, सूचना प्रविधि अधिकृत पदको
खुला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम
प्रथम पत्र :
खण्ड (क) सामान्य ज्ञान, बौद्धिक परीक्षण तथा विद्युत नियमन सम्बन्धी : ५० अङ्क

1. **सामान्य ज्ञान (१५ × १ = १५ अङ्क)**
    1.1 नेपालको भूगोल र आर्थिक तथा सामाजिक क्रियाकलापः धरातलीय स्वरुपको किसिम र विशेषता, नेपालमा पाइने हावापानीको किसिम र विशेषता, नदीनाला, तालतलैया, खनिज पदार्थ, प्राकृतिक श्रोत साधन, विद्युत, शिक्षा, स्वास्थ्य र सन्चार सम्बन्धी जानकारी
    1.2 नेपालको सामाजिक एवं सांस्कृतिक अवस्थाः परम्परा, धर्म, जाति, भाषाभाषी, कला, संस्कृति र साहित्य
    1.3 नेपालमा विद्युत विकास, उर्जाका श्रोत र सम्भावना
    1.4 नेपालको संघीय, प्रादेशिक र स्थानीय संरचना तथा शासन प्रणाली सम्बन्धी जानकारी
    1.5 विश्वको भूगोलः महादेश, महासागर, अक्षांश, देशान्तर, अन्तर्राष्ट्रिय तिथि रेखा, समय, पर्वतशृंखला, नदी, हिमनदी. ताल, हिमताल
    1.6 संयुक्त राष्ट्र संघ र यसका एजेन्सीहरू सम्बन्धी जानकारी
    1.7 दक्षिण एशियाली क्षेत्रीय सहयोग संगठन (SAARC), SAARC- Energy Center, बिमस्टेक (BIMSTEC) सम्बन्धी जानकारी
    1.8 राष्ट्रिय र अन्तर्राष्ट्रिय महत्त्वका समसामयिक घटना तथा नवीनतम गतिविधिहरू

2. **संविधान, विद्युत क्षेत्रको नियमन र सम्बन्धित कानुनी व्यवस्था (१५ × १ = १५ अङ्क)**
    2.1 नेपालको संविधानः मौलिक हक र कर्तव्य, राज्यका निर्देशक सिद्धान्त, नीति तथा दायित्व, अनुसूचीहरू
    2.2 विद्युत ऐन, २०४९ र विद्युत नियमावली, २०५०
    2.3 विद्युत नियमन आयोग ऐन, २०७४ तथा विद्युत नियमन आयोग नियमावली, २०७५
    2.4 विद्युत नियमन आयोग कर्मचारी प्रशासन विनियमावली, २०८१
    2.5 सार्वजनिक खरिद ऐन, २०६३
    2.6 विद्युत क्षेत्रमा नियमनको अवधारणा
    2.7 विद्युत नियमन आयोगको काम, कर्तव्य तथा अधिकार
    2.8 उपभोक्ता महशुल निर्धारणको सिद्धान्त तथा प्रक्रिया
    2.9 विद्युत खरिद बिक्री दर निर्धारणका सिद्धान्त तथा प्रक्रिया
    2.10 विद्युत नियमन आयोगको पाँच वर्षे मार्गचित्र २०८१-८६

3. **Aptitude Test (20 × 1 = 20 Marks)**
    3.1 Verbal reasoning :
    Series, analogy, classification, coding-decoding, insert the missing character, direction and distance sense test, ranking order, assertion and reason, statement and conclusion
    3.2 Non-verbal reasoning:
    Series, analogy, classification, matrices, figure formation and analysis, dot situation, water images, mirror images, embedded figures.
    3.3 Quantitative aptitude:
    Arithmetical reasoning/operation, percentage, fraction, ratio, average, profit & loss, time and work
    3.4 General mental ability, logical reasoning and analytical ability, data interpretation

खण्ड (ख)
General Technical Subject: (50 ×1 = 50 Marks)

1. **Computer Networks**
   1.1 Definitions, Importance, Applications
   1.2 Network Topologies, Client/Server and Peer-to-Peer, OSI and TCP/IP Reference Model
   1.3 Physical and Data Link Layer: Wired/Wireless communications media, Framing/Flow/Error control, error detection and correction (CRC, Hamming), multiple access protocols, 802.3 Ethernet, CSMS/CD, Token Bus, Token Ring, Hubs, Bridges, and Switches, Wireless LANs, PPP (Point to Point Protocol), datagram and virtual circuits switching
   1.4 Network Layer: services, Routing Fundamentals - Unicast Routing (RIP, OSPF), Multicast routing, IPv4 and IPv6 addressing types/classifications and header structure, ICMPv4/v6 (Internet Control Message Protocol), Traffic shaping and congestion control: leaky bucket and token bucket
   1.5 Transport Layer: principles, multiplexing and demultiplexing, Port addressing, TCP/UDP header structure, TCP congestion control, Socket programming fundamentals
   1.6 Upper Layers: Cryptography and network security: Firewall, DMZ, IPS/IDS, Vulnerabilities and thread detection and prevention. Web/Mail/FTP/DNS/Cache server fundamentals
   1.7 Latest networking concept: Software Defined Networking, 5/6th generation networking (5/6G), Latest network migration, IP interconnection, tired ISP network. Data center networking, distributed and cloud computing/federated networking

2. **Structured and Object-Oriented Programming**
   2.1 Overview of programming paradigms, Differences between structured and object-oriented programming
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   2.3 Control and looping constructs
   2.4 Pointers and dynamic memory allocation (C/C++)
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   2.6 Encapsulation, Inheritance, Polymorphism, Abstraction, Exception handling
   2.7 SOLID principles of OOP, Code reuse and maintainability, Design patterns (Singleton, Factory, MVC, etc.)

3. **Artificial Intelligence and Machine Learning**
   3.1 Definition and history of AI
   3.2 AI vs. Machine Learning vs. Deep Learning
   3.3 Supervised and Unsupervised Learning, Reinforcement Learning Basics
   3.4 Neural Networks and Deep Learning Introduction
   3.5 Uninformed (Blind) Search (BFS, DFS), Informed (Heuristic) Search (Greedy Best-First Search, A*, Hill Climbing and Simulated Annealing
   3.6 Propositional and First-Order Logic, Ontologies and Semantic Networks, Expert System
   3.7 Natural Language Processing - Text Processing and Tokenization, Named Entity Recognition (NER), Sentiment Analysis and Chatbots
   3.8 Computer Vision: Object Detection and Recognition, Convolutional Neural Networks (CNNs)

3.9   AI in Autonomous Systems, Robot Perception and Decision Making

3.10   Ethical Considerations in AI Development, AI Safety and Explainability

4. Data Structures

4.1   General concepts: Abstract data type, Time and space analysis of algorithms, Bio Oh and theta notations, Average, best- and worst-case analysis

4.2   Linear data structures, Stack, Queues and Linked List, Hashing

4.3   Searching and Sorting Algorithms.

4.4   Trees: General and binary trees, Representations and traversals, Binary search trees, balancing trees, AVL trees

4.5   Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion

4.6   Graphs and diagraphs

5. Computer Architecture and Organization

5.1   Basic Structures: sequential circuits, design procedure, state table and state diagram, Von Neumann / Harvard architecture, Pipelining and instruction-level parallelism

5.2   Instruction cycle and execution, Hardwired vs. Microprogrammed control, RISC vs. CISC architectures

5.3   Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle and excitation cycle

5.4   Processing Unit: instruction formats, arithmetic and logical instruction

5.5   Addressing modes: 8085/8086

5.6   Input Output Organization: I/O programming, memory mapped I/O, basic interrupt handling mechanisms, DMA

6. Digital Logic and Design

6.1   Boolean algebra and Logic Gates, Basic and Universal Gates

6.2   Combinational Logic Circuits: Adders, Subtractor, Multiplexer, Encoders/Decoders

6.3   Sequential Logic: Flip-Flops (SR, D, JK, T), Counters (Asynchronous & Synchronous)

6.4   Design of Synchronous Sequential Circuits, Asynchronous Circuit Design

6.5   Programmable Logic Devices (PLD, FPGA, CPLD)

6.6   Counters and Registers

6.7   IC logic families

7. Database Management System

7.1   Introduction: Types of Databases (Hierarchical, Network, Relational, NoSQL), SQL Basics (DDL, DML, DCL, TCL), Functional dependency and relational database design, File structure

7.2   Keys (Primary Key, Foreign Key, Candidate Key, Super Key), Integrity Constraints (Entity Integrity, Referential Integrity)

7.3   Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF)

7.4   Transaction Management and Concurrency Control: ACID Properties (Atomicity, Consistency, Isolation, Durability), Concurrent execution of the user programs, transactions, Concurrency control techniques

7.5   Backup and Crash Recovery: Types of failure, Recovery techniques, Log-Based

Recovery and Shadow Paging
- 7.6 Query Processing and Optimization
- 7.7 Indexing: Hash based indexing; Tree based indexing
- 7.8 Distributed Database Systems and Object-oriented database system
- 7.9 Data Mining and Data Warehousing, Geodatabase
- 7.10 Big Data Computing, Cloud Databases and Database-as-a-Service (DBaaS)

8. Operating System
- 8.1 Definition and Functions of an Operating System, Types of Operating Systems (Batch, Time-Sharing, Distributed, Real-Time, Embedded)
- 8.2 Process and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
- 8.3 Process Scheduling (Long-Term, Short-Term, and Medium-Term Scheduling), Context Switching, CPU Scheduling: FCFS, Shortest Job Next (SJN/SJF), Round Robin (RR), Priority Scheduling
- 8.4 Semaphores and Mutexes, Deadlock conditions and preventions
- 8.5 Memory Management, Paging and Segmentation, Page Replacement Algorithms (FIFO, LRU, Optimal)
- 8.6 Input Output and Files: I/O devices and its organization, Principles of I/O software and hardware, Disks, Files and directories organization, File System Implementation
- 8.7 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters,
- 8.8 Distributed OS: ONOS, Containerization (Docker, Kubernetes)

9. Theory of Computation
- 9.1 BNF, Languages, Grammars
- 9.2 DFA and NDFA, regular expressions, regular grammars
- 9.3 Closure, homomorphism
- 9.4 Pigeonhole principle, pumping lemma
- 9.5 CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs
- 9.6 Recursively enumerable languages, Unrestricted grammars
- 9.7 The Chomsky hierarchy, Undecidable problems, Church's Thesis
- 9.8 Complexity Theory, P and NP hard problem

10. Computer Graphics
- 10.1 Graphics Concepts, Types of Computer Graphics (Raster vs. Vector)
- 10.2 Input devices and techniques
- 10.3 Basic raster graphics algorithms and primitives
- 10.4 Scan conversion, Graphics hardware
- 10.5 2D geometrical transformations and viewing, Translation, Rotation, Scaling, Shearing, and Reflection, Window-to-Viewport Transformation
- 10.6 3D geometry and viewing, 3D Transformations (Translation, Rotation, Scaling), Projections (Orthographic and Perspective)
- 10.7 Hidden Surface Removal Algorithms (Z-Buffer, Painter's Algorithm), Shading Models (Flat, Gouraud, Phong)

11. Basic Electrical & Electronics
- 11.1 Electrical

11.1.1 Basic Circuit Theory
11.1.2 AC circuit Fundamentals
11.1.3 Magnetic circuits and Transformers
11.1.4 Transient Analysis, Filters

11.2 Electronics
11.2.1 Semiconductors, Diodes and Diode Circuits, Transistors
11.2.2 Transistor modeling
11.2.3 Biasing and Amplification
11.2.4 Small Signal amplifiers and frequency response
11.2.5 Large signal amplifiers, feedback amplifiers and oscillators
11.2.6 Operational amplifiers

11.3 Principles of Electronics Communications
11.3.1 Block Diagram of analog/digital communication system
11.3.2 Analog and Digital modulation techniques
11.3.3 Fundamentals of Error Detection and Correction
11.3.4 Performance evaluation of analog and digital communication systems: SNR and BER

12. Software Engineering Principles (System analysis and design)

12.1 Software process: The software lifecycle models, risk-driven approaches
12.2 Software Project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
12.3 Modeling: Context diagram, data flow diagram, UML modeling
12.4 Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
12.5 Software design: Design for reuse, design for change, design notations, design evaluation and validation
12.6 Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
12.7 Maintenance: problem and nature of maintenance, planning for maintenance
12.8 Software Engineering issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI- CMM, CASE tools.

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द्वितीय पत्र :
Technical Subject
खण्ड (क) : ५० अङ्क

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4.5 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion

4.6 Graphs and diagraphs

5. Computer Architecture and Organization

5.1 Basic Structures: sequential circuits, design procedure, state table and state diagram, Von Neumann / Harvard architecture, Pipelining and instruction-level parallelism

5.2 Instruction cycle and execution, Hardwired vs. Microprogrammed control, RISC vs. CISC architectures

5.3 Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle and excitation cycle

5.4 Processing Unit: instruction formats, arithmetic and logical instruction

5.5 Addressing modes: 8085/8086

5.6 Input Output Organization: I/O programming, memory mapped I/O, basic interrupt handling mechanisms, DMA

6. Digital Logic and Design

6.1 Boolean algebra and Logic Gates, Basic and Universal Gates

6.2 Combinational Logic Circuits: Adders, Subtractor, Multiplexer, Encoders/Decoders

6.3 Sequential Logic: Flip-Flops (SR, D, JK, T), Counters (Asynchronous & Synchronous)

6.4 Design of Synchronous Sequential Circuits, Asynchronous Circuit Design

6.5 Programmable Logic Devices (PLD, FPGA, CPLD)

6.6 Counters and Registers

6.7 IC logic families

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7. Database Management System

7.1 Introduction: Types of Databases (Hierarchical, Network, Relational, NoSQL), SQL Basics (DDL, DML, DCL, TCL), Functional dependency and relational database design, File structure

7.2 Keys (Primary Key, Foreign Key, Candidate Key, Super Key), Integrity Constraints (Entity Integrity, Referential Integrity)

7.3 Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF)

7.4 Transaction Management and Concurrency Control: ACID Properties (Atomicity, Consistency, Isolation, Durability), Concurrent execution of the

user programs, transactions, Concurrency control techniques

7.5 Backup and Crash Recovery: Types of failure, Recovery techniques, Log-Based Recovery and Shadow Paging

7.6 Query Processing and Optimization

7.7 Indexing: Hash based indexing; Tree based indexing

7.8 Distributed Database Systems and Object-oriented database system

7.9 Data Mining and Data Warehousing, Geodatabase

7.10 Big Data Computing, Cloud Databases and Database-as-a-Service (DBaaS)

8. Operating System

8.1 Definition and Functions of an Operating System, Types of Operating Systems (Batch, Time-Sharing, Distributed, Real-Time, Embedded)

8.2 Process and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock

8.3 Process Scheduling (Long-Term, Short-Term, and Medium-Term Scheduling), Context Switching, CPU Scheduling: FCFS, Shortest Job Next (SJN/SJF), Round Robin (RR), Priority Scheduling

8.4 Semaphores and Mutexes, Deadlock conditions and preventions

8.5 Memory Management, Paging and Segmentation, Page Replacement Algorithms (FIFO, LRU, Optimal)

8.6 Input Output and Files: I/O devices and its organization, Principles of I/O software and hardware, Disks, Files and directories organization, File System Implementation

8.7 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters,

8.8 Distributed OS: ONOS, Containerization (Docker, Kubernetes)

9. Theory of Computation

9.1 BNF, Languages, Grammars

9.2 DFA and NDFA, regular expressions, regular grammars

9.3 Closure, homomorphism

9.4 Pigeonhole principle, pumping lemma

9.5 CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs

9.6 Recursively enumerable languages, Unrestricted grammars

9.7 The Chomsky hierarchy, Undecidable problems, Church's Thesis

9.8 Complexity Theory, P and NP hard problem

10. Computer Graphics

10.1 Graphics Concepts, Types of Computer Graphics (Raster vs. Vector)

10.2 Input devices and techniques

10.3 Basic raster graphics algorithms and primitives

10.4 Scan conversion, Graphics hardware

10.5 2D geometrical transformations and viewing, Translation, Rotation, Scaling, Shearing, and Reflection, Window-to-Viewport Transformation

10.6 3D geometry and viewing, 3D Transformations (Translation, Rotation, Scaling), Projections (Orthographic and Perspective)

10.7 Hidden Surface Removal Algorithms (Z-Buffer, Painter's Algorithm), Shading Models (Flat, Gouraud, Phong)

11. Basic Electrical & Electronics

11.1   Electrical
   11.1.1 Basic Circuit Theory
   11.1.2 AC circuit Fundamentals
   11.1.3 Magnetic circuits and Transformers
   11.1.4 Transient Analysis, Filters

11.2   Electronics
   11.2.1 Semiconductors, Diodes and Diode Circuits, Transistors
   11.2.2 Transistor modeling
   11.2.3 Biasing and Amplification
   11.2.4 Small Signal amplifiers and frequency response
   11.2.5 Large signal amplifiers, feedback amplifiers and oscillators
   11.2.6 Operational amplifiers

11.3   Principles of Electronics Communications
   11.3.1 Block Diagram of analog/digital communication system
   11.3.2 Analog and Digital modulation techniques
   11.3.3 Fundamentals of Error Detection and Correction
   11.3.4 Performance evaluation of analog and digital communication systems: SNR and BER

12. Software Engineering Principles (System analysis and design)

12.1   Software process: The software lifecycle models, risk-driven approaches

12.2   Software Project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics

12.3   Modeling: Context diagram, data flow diagram, UML modeling

12.4   Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.

12.5   Software design: Design for reuse, design for change, design notations, design evaluation and validation

12.6   Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance

12.7   Maintenance: problem and nature of maintenance, planning for maintenance

12.8   Software Engineering issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI- CMM, CASE tools.