

कर्मचारी सञ्चय कोष
खुल्ला/आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

१. पाठ्यक्रमको परिचय :

- (क) तह र पद : तह ७, उप प्रबन्धक (कम्प्युटर इन्जिनियर)
- (ख) सेवा : प्राविधिक
- (ग) परीक्षाको किसिम :
 - लिखित २०० पूर्णाङ्क
 - अन्तर्वार्ता ३० पूर्णाङ्क
- (घ) आवश्यक न्यूनतम योग्यता : मान्यता प्राप्त शिक्षण संस्थाबाट कम्प्युटर इन्जिनियरिङ्ग अथवा इलेक्ट्रोनिक्स इन्जिनियरिङ्ग विषयमा स्नातक वा सो सरह उपाधि प्राप्त गरेको ।
- (ङ) पाठ्यक्रमको उद्देश्य :
कोषको तह ७ कम्प्युटर इन्जिनियर (प्राविधिक) पदका लागि निर्धारित कार्यविवरणलाई दृष्टिगत गरी तोकिएको आवश्यक न्यूनतम योग्यता पुगेका योग्य उमेदवारहरूमध्येबाट दैनिक कार्य संचालनका लागि कोषको कार्यक्षेत्र र कार्य प्रकृतिसंग सम्बन्धित इन्जिनियरिङ्ग विषयमा उमेदवारहरूको सैद्धान्तिक र व्यावहारिक ज्ञानको परीक्षण गर्नु प्रस्तुत पाठ्यक्रमको उद्देश्य रहेको छ ।

२. परीक्षा योजना :

| पत्र | विषय | परीक्षाको किसिम | प्रश्न संख्या | अङ्कभार | पूर्णाङ्क | उत्तीर्णाङ्क | समय |
|---------|--|-----------------|---------------|---------|-----------|--------------|---------|
| प्रथम | सेवा सम्बन्धी १. Software, Hardware तथा Networking सम्बन्धी Practical knowledge वारे | वस्तुगत | ६० | ६०x२ | १२० | ४८ | १ घण्टा |
| द्वितीय | २. Programming Language 'C' मा कम्प्युटर प्रयोग गर्ने गरी साधारण प्रोग्रामको विकास गर्ने | प्रयोगात्मक | २ | २x४० | ८० | ३२ | २ घण्टा |

द्रष्टव्य:

- (क) लिखित परीक्षाको भाषा, नेपाली वा अग्रेजी वा दुवै हुन सक्नेछ ।
- (ख) पाठ्यक्रमको प्रथम र द्वितीय पत्रको विषयवस्तु फरक फरक हुनेछन् ।

पाठ्यक्रमको विस्तृत विवरण

Section A

| <u>Unit</u> | | <u>No.of Questions</u> |
|-------------|--|------------------------|
| 1. | Foundation Concepts of Information Technology | 5 |
| | <ul style="list-style-type: none"> • Fundamentals of Computer and Information Technology • Components and Architecture of Computers, Connecting the Components, • Computer Hardware (I/O, Storage, CPU, Memory, Peripherals), Software (introduction and classifications) • Computer Operating System • File and Disk Management • Browser, E-mails, Internet, Intranet, Extranets • Basic concepts of e-commerce, electronic payment | |
| 2. | Computer Architecture & organization and micro-processors | 5 |
| | <ul style="list-style-type: none"> • Basic Structures : sequential circuits, design procedure, state table and state diagram, vo Neumann / Harvard architecture, RISC/CISC architecture • Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction, cycle and excitation cycle • Processing Unit: instruction formats, arithmetic and logical instruction • Addressing modes • Input Output organization : I/O programming, memory mapped I/O, basic interrupt system DMA • Arithmetic • Memory Systems • 808X and Intel Microprocessors: programming and interfacing | |
| 3. | Digital Design | 5 |
| | <ul style="list-style-type: none"> • Digital and Analog Systems. • Logic Elements • Combinational Logic Circuits • Sequential Logic • Arithmetic Circuits • MSI Logic circuits • Counters and Registers • IC logic Families • Interfacing with Analog Devices • Momory Devices | |
| 4. | Basic Electrical & Electronics | 5 |
| | <ul style="list-style-type: none"> • Electrical : <ul style="list-style-type: none"> ○ Basic Circuit Theory ○ AC circuit Fundamentals ○ Transient Analysis, Filters • Electronics <ul style="list-style-type: none"> ○ Semiconductors, Diodes and Diode Circuits, Transistors ○ Transistor modeling ○ Biasing and Amplification ○ Small Signal amplifiers and frequency response ○ Large signal amplifiers, feedback amplifiers and Oscillators ○ Operational amplifiers | |
| 5. | Principles of Electronic Communications | 5 |
| | <ul style="list-style-type: none"> • Block Diagram of analog/digital communication system • Analog and Digital modulation techniques • Fundamentals of Error Detection and Correction • Performance evaluation of analog and digital communication systems: SNR and BER | |
| 6. | Computer Networks | 5 |

- Protocol stack, switching
- Link Layer: services, error detection and correction, multiple access protocols, LAN addressing and ARP (Address Resolution Protocol), Ethernet, CSMA/CD multiple access protocol, Hubs, Bridges, and Switches, Wireless LANs, PPP (Point to point Protocol), Wide area protocols
- Network Layer: services, datagram and virtual circuits, routing principles and algorithms, Internet Protocol (IP), IP addressing, IP transport, fragmentation and assembly, ICMP (Internet Control Message Protocol), routing and the internet, RIP (Routing Information Protocol), OSPF (Open Shortest Path First), router internals, IPv6)
- Transport Layer : principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control.

Section B

1. Structured and object oriented programming 8
 - Data types, ADT
 - Operators, variables and assignments, control structures
 - Procedure/function
 - Class definitions, encapsulation, inheritance, object composition, Polymorphism
 - Pattern and Framework
 - 'C' Programming Language & algorithms
2. Data structures 4
 - Linear data structures
 - Trees : General and binary trees, Representations and traversals, Binary search trees, balancing trees, AVL trees, 2-3 trees, red-black trees, self-adjusting trees, Splay Trees
 - Algorithm design techniques : Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
 - Hashing & sorting
3. Software Engineering principles (System analysis & design) 3
 - Software process : The software lifecycle models, risk-driven approaches
 - Software Project management : Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
 - Software requirements : Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
 - Software design : Design for reuse, design for change, design notations, design evaluation and validation
 - Implementation : Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
 - Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
 - SE issues : Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools
4. Database management system 5
 - Fundamental Concepts of Databases, Database Management Systems (DBMS) and Relational Database Management Systems (RDBMS)
 - Three-Schema Architecture of Databases, Data Independence, Converting E-R diagrams to Relations
 - Normalization : 1NF, 2NF, 3NF, BCNF, 4NF
 - Architecture of DBMS : Client-server, Open Architectures, Transaction Processing, Multi-User & Concurrency, and Backup & Recovery Database,
 - Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
 - Crash Recovery : Types of failure, Recovery techniques
 - Query Processing and Optimization
 - Indexing : Hash based indexing, Tree based indexing
 - Distributed Database Systems and Object oriented database system
 - Data Mining and Data Warehousing

- **Security Management System**

5. **Operating System**

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- **Processes and Threads : Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock.**
- **Scheduling**
- **Memory management**
- **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.**
- **Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters,**
- **Security : Authentication and Access Authorization, System Flaws and Attacks, Trusted system.**

6. **Emerging Technologies**

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- **Parallel Distributed computing & cloud computing**
- **High speed Networks**
- **Adaptive web technology**
- **Cryptography and network Security**
- **E-commerce**
- **Embedded systems**
- **GIS/Remote sensing/GPS**