Information Technology Officer (ITO)

Curriculum

Maharajgunj Medical Campus, Institute of Medicine, Tribhuvan University

2026

Total Marks: 100
Theory: 60
Practical: 20
Interview: 10
Academic credentials: 10

1. Purpose and Competency Profile

This curriculum assesses a candidate's capacity to independently maintain, troubleshoot and expand office network across buildings, floors, rooms, blocks, and halls. It also tests the ability to plan and execute structured cabling and CCTV works, including identifying the tools and materials each job needs, and to enter, validate, analyse and monitor website and EMIS data.

Table 1

Competency Profile and Expected Capabilities

Competency	Expected capability
Network operations and maintenance	Keep LAN, Wi-Fi, internet links, firewall and switches running across all buildings and hostels; perform preventive maintenance and keep network documentation current.
Problem identification and resolution	Diagnose faults layer by layer, isolate the root cause with test tools, restore service quickly, and record fault, cause and fix.
Network expansion and planning	Survey sites, design topology and VLANs, estimate users, bandwidth, switch ports and PoE budget, and prepare BoQ, specifications and cost estimates.
Structured cabling and physical infrastructure	Lay, terminate, label and test copper and fibre cabling; install racks, PVC trunking (listic/casing-capping), conduit and earthing to standard.
CCTV and surveillance	Plan camera coverage; install, configure and maintain IP/analog cameras, NVR/DVR and storage; manage footage access lawfully.
Website and EMIS data management	Enter, update, validate and publish institutional data and notices; run queries, analyse data and monitor completeness, accuracy and timeliness.
Security, governance and procurement	Apply cybersecurity, backup and access-control practice; draft ICT specifications and procurement documents within prevailing laws.
Communication and coordination	Write technical reports and user guidance; coordinate with departments, committees, ISPs and AMC vendors.

2. Examination Scheme

The written paper runs as one 2-hour sitting; the computer-based practical runs in a computer lab on a separate day.

Table 2

Examination Scheme

Component	Marks	Suggested duration
MCQs (40 × 1 marks)	40	45 minutes
Short-answer questions (2 × 5 marks)	10	30 minutes
Long-answer question (1 × 10 marks)	10	45 minutes
Computer-based practical	20	150 minutes
Structured interview	10	15-20 minutes
Academic Credentials	10	
Total	**100**	

3. Theory Blueprint (60 Marks)

Computer fundamentals, networks and protocols carries the most weight (20 of 60 marks, including the compulsory long-answer question); the two short-answer questions fall in databases (IV) and programming, web and information systems (V).

Table 3

Theory Blueprint: Questions and Marks by Subject Area

Subject area	MCQ (1 mark each)	SAQ (5 marks each)	LAQ (10 marks)	Total marks
I. Computer fundamentals, networks and protocols	9	0	1	19
II. Data Structure, Algorithms, System Analysis and Design	5	0	0	5
III. Operating Systems, Application Packages, Computer Hardware, Cables, CCTV and electronic security systems	9	0	0	9
IV. Database Management System and Design	5	1	0	10
V. Programming Language, Web Technology, and Information System	5	1	0	10
VI. Cybersecurity, IT governance, procurement, IT Policy and History, TU laws	7	0	0	7
Total Marks	**40**	**10**	**10**	**60**

4. Detailed Theoretical Syllabus

The syllabus follows the six areas of the blueprint and covers the technical units of the Public Service Commission's Computer Officer syllabus, extended with TU laws, cabling, CCTV and EMIS work. Questions are vendor-neutral; where a command or menu is vendor-specific, any equivalent correct answer earns full marks.

I. Computer Fundamentals, Networks and Protocols

- **Computer fundamentals:** types of computers by size and function, generations, components and architecture; input, processing (CPU, memory), storage and output devices; number systems and data representation; application software; Internet, intranet, extranet and e-mail.
- **Computer architecture and organization:** instruction set architecture, ALU design, Datapath (single and multiple cycle), pipelining, memory hierarchy (cache, main memory, storage), buses and I/O systems.
- **Network theory and models:** network definition, types (PAN, LAN, MAN, WAN) and topologies; OSI and TCP/IP models, encapsulation, connection-oriented and connectionless delivery; Ethernet (IEEE 802.3) standards and speeds; legacy Token Ring and FDDI.
- **Addressing and protocols:** MAC addressing and ARP; IPv4 classes, private ranges, subnetting and VLSM, NAT/PAT, APIPA; IPv6 basics and dual stack; TCP and UDP ports; DHCP, DNS, NTP, ICMP, SNMP, SSH, FTP/SFTP, HTTP/HTTPS, SMTP/IMAP/POP3, LDAP and RADIUS; NetBIOS name resolution; TCP/IP utilities.
- **LAN infrastructure:** hubs, bridges and switches; VLANs (802.1Q), access and trunk ports, STP/RSTP, link aggregation, port security, PoE; IP routing, routing tables, static and default routes, OSPF fundamentals, inter-VLAN routing, router discovery and data movement in a routed network.
- **Wireless networking:** IEEE 802.11a/b/g/n/ac/ax/be (Wi-Fi 4 to Wi-Fi 7), 2.4/5/6 GHz bands, channel planning and interference, WPA2/WPA3, 802.1X, captive portals, roaming, mesh, and controller- or cloud-managed APs; coverage and capacity planning.
- **WAN and remote networking:** WAN environment and transmission technologies (FTTH, leased line, MPLS), WAN devices, ISP links, bandwidth management and QoS, multi-WAN failover; remote access protocols and VPN technologies; voice over data (VoIP) services.
- **Storage and fault tolerance:** RAID, NAS, SAN and clustering; disaster recovery planning, data backup and fault tolerance.
- **Network operations and troubleshooting:** systematic troubleshooting (layer-by-layer, divide-and-conquer); ping, traceroute/tracert, ipconfig/ip, arp, nslookup/dig, netstat/ss, nmap, iperf3, Wireshark and Wi-Fi analyzers; network baselines and monitoring (SNMP, syslog, NMS); common faults such as loops, IP conflicts, rogue DHCP, DNS and gateway failure, PoE exhaustion and runs beyond 100 m; network diagrams, port maps and IP registers.
- **Network expansion planning:** needs assessment, site survey, user and device counts, bandwidth estimation, port and PoE budgeting, uplink sizing, topology and VLAN design, BoQ of devices, cables, materials, tools and labor, cost estimate, specifications, implementation schedule, testing and handover.

II. Data Structure, Algorithms, System Analysis and Design

- **Data structures:** abstract data types; arrays, lists and linked lists; stacks, queues and priority queues; trees (binary, binary search, balanced and AVL trees) and traversal; indexing, hashing and suffix trees; graphs.
- **Algorithms:** worst-case and expected time complexity; analysis of recursive and non-recursive algorithms; searching, merging and sorting; divide-and-conquer, dynamic programming, greedy methods and backtracking; depth-first and breadth-first search, shortest paths, minimum spanning trees and directed acyclic graphs.
- **System concepts:** system owners, users, designers, builders and analysts; system development life cycle and process models (waterfall, iterative, agile); personal, centralized and distributed systems; components of computer-based information systems.
- **Analysis:** problem identification, feasibility (technical, operational, economic), requirements gathering and SRS; Joint Application Development (purpose, scope, sponsor, users, analyst, project leader, record keeper, time keeper).
- **Design and modeling:** data flow diagrams (context, top-level and expanded levels, data stores, external entities); object-oriented concepts (class, object, association, composition, inheritance); UML use case, class, state and event-flow diagrams; design methods, testing, implementation and documentation of manual and automated systems.

III. Operating Systems, Application Packages, Computer Hardware, Cables, CCTV and Electronic Security Systems

- **Operating system concepts:** definition, development and functions; processes and threads, scheduling, inter-process communication and deadlocks; memory management and virtual memory; file systems, disk allocation and scheduling; parallel and distributed processing; security threats to operating systems.
- **Operating system administration:** MS-DOS, Windows, Unix and Linux families and architectures; command line (CMD, PowerShell, Bash); users, groups and permissions; disks, partitions and file systems; network sharing and printing; monitoring and troubleshooting Windows and Linux; installation, imaging, patching and virtualization basics.
- **Application Packages:** Word Processing, Spreadsheet, Presentation and Using Devanagari (Nepali) fonts and Nepali Unicode in documents, worksheets and slides.
- **Computer hardware and maintenance:** motherboard, CPU, RAM, storage (HDD, SSD, NVMe), power supply, BIOS/UEFI; printers, scanners and peripheral ports; assembly, preventive maintenance and fault diagnosis; UPS sizing; projectors, sound systems and video conferencing equipment for halls.
- **Structured cabling:** ANSI/TIA-568 (T568A/T568B), TIA-606 labeling; Cat5e/Cat6/Cat6A, UTP/FTP; RJ45 (standard and pass-through), keystone jacks, faceplates and patch panels; 90 m permanent link and 100 m channel limits; single-mode and multimode fiber, LC/SC connectors, splicing and SFP modules.
- **Physical infrastructure and tools:** PVC trunking/casing-capping (listic), conduit and HDPE duct, cable trays, racks and cable management, earthing and surge protection; crimper, punch-

down tool, cable tester, tone generator, certifier, OTDR and fusion splicer; measuring runs and wastage allowance; working-at-height and electrical safety.

- **CCTV systems:** analog HD vs IP cameras; dome, bullet, turret, PTZ and fisheye types; resolution, focal length, field of view, IR and WDR; DVR/NVR, H.264/H.265, bitrate and storage calculation; ONVIF and RTSP; PoE, CCTV VLAN and UPS; coverage design using DORI criteria; installation, maintenance and troubleshooting; default-password, firmware and remote-access hardening; privacy rules, footage access and evidence handling.
- **Electronic security systems:** biometric and RFID access control and attendance devices, intercom, public address and alarm basics.

IV. Database Management System and Design

- **DBMS concepts:** data models, the relational model, keys and integrity constraints, RDBMS; client-server and open architectures; transactions and ACID, multi-user concurrency, backup and recovery.
- **SQL:** basic SELECT statements; restricting and sorting data; single-row, date-time and group functions; joins across multiple tables; subqueries; set operators; inserting, updating and deleting data; creating and managing tables, views and indexes; controlling user access (GRANT, REVOKE); embedded SQL, stored procedures and triggers.
- **Database design:** conceptual design with E-R diagrams (strong and weak entities; simple, composite, multivalued, null and derived attributes; degree and cardinality; specialization, generalization and aggregation); mapping conceptual to logical design; physical design, integrity and correctness; relational algebra and relational calculus.
- **Normalization:** functional dependencies; 1NF, 2NF, 3NF, BCNF, 4NF, 5NF and DKNF; pragmatic denormalization.
- **Products and trends:** MySQL/MariaDB, PostgreSQL, Oracle, SQL Server, DB2 and SQLite; NoSQL concepts; data warehousing and data mining basics.
- **EMIS data management:** data dictionaries, master data and category codes, validation rules, unique IDs, duplicate detection and audit trails; data cleaning and the quality dimensions of completeness, accuracy, consistency, timeliness and validity; spreadsheet pivot tables, Power Query and dashboards; confidentiality of data.

V. Programming Language, Web Technology, and Information System

- **Programming concepts:** history and paradigms (procedural, structured, object-oriented, functional); compilers, interpreters, assemblers and virtual machines; fundamental issues in language design; declaration, modularity and storage management; C, C++ and Java fundamentals, with Python and PHP basics.
- **Object-oriented programming:** classes and objects, encapsulation, inheritance, polymorphism, abstraction, exceptions; component-based software development.
- **Compiler design:** phases of compilation; lexical, syntax and semantic analysis; run-time environment; intermediate code generation and code optimization, including loop optimization; compiler generation tools.

- **Web technology:** client-server computing and HTTP; HTML5, CSS and JavaScript; responsive design; server-side scripting and database-driven sites; XML, JSON and web APIs; CMS (WordPress) administration; domains, DNS, hosting, SSL/TLS and backups; web security (SQL injection, XSS, CSRF); accessibility; Nepali Unicode content and institutional publishing workflows (notices, results, tenders, RTI disclosure).
- **Information systems:** transaction processing, MIS, DSS, group decision support, executive and knowledge management systems; information systems and decision making; strategic use of IT; work-process redesign (reengineering); ERP; information systems security, privacy and global IT issues; multimedia; health and academic information systems (EMIS, HMIS, DHIS2) in an institutional setting.
- **E-commerce and e-governance:** e-commerce strategies and security; B2B, B2C, B2E, C2C, G2G and G2C models; e-governance success models; electronic payment systems, e-banking, EDI and SWIFT; e-marketing; encryption and decryption methods.

VI. Cybersecurity, IT Governance, Procurement, IT Policy and History, TU Laws

- **Cyber security:** CIA triad; viruses, worms, Trojan horses, ransomware, phishing and social engineering; symmetric and asymmetric encryption, hashing, digital signatures and PKI; firewalls, IDS/IPS, endpoint protection, patching, least privilege, password policy and MFA; 3-2-1 backups; incident response and reporting.
- **IT governance and service management:** ICT and acceptable-use policies, SOPs, asset and inventory registers, software licensing (proprietary, freeware, open-source), helpdesk and service levels, AMC and vendor management, institutional e-mail and account lifecycle, IT project management basics.
- **ICT procurement:** needs identification, technical specifications, BoQ and cost estimates, procurement methods (quotation, sealed bid, e-bidding through e-GP), bid evaluation, warranty and AMC terms, inspection and acceptance; Public Procurement Act, 2063 and Public Procurement Regulations, 2064.
- **IT policy and law:** National ICT Policy; Electronic Transactions Act, 2063; Copyright Act, 2059; Individual Privacy Act, 2075; Right to Information Act, 2064; National Cyber Security Policy, 2080; Digital Nepal Framework; any IT or cyber-security legislation in force under the rule in Section 7.
- **IT in Nepal:** history and milestones of IT in Nepal and its key institutions; uses of computers and software development in Nepal; Nepali Unicode, Nepali fonts and legacy-font conversion; licensing issues; TU and IOM structure and rules relevant to ICT.
- **TU Laws:** TU Executive Council, Formation, Roles and Responsibilities, TU Service Commission, Formation, Roles and Responsibilities

5. Practical Examination (20 Marks)

The practical is fully computer-based and runs in one 150-minute session: six topics with two short questions each (12 questions), each question worth 2.5 marks, allowing about 25 minutes per

topic. All tasks use only the candidate's workstation, the software in Annex A, the lab network and the task files supplied.

Table 4

Computer-Based Practical Tasks

Topic	No. of Question	Marks	Expected deliverable
A. Computer Hardware and Operating system administration	1+1	5	Setup / assemble a computer set from unplugged state and turn on, Application programs setup / removal, Troubleshooting, repair and maintenance of a computer
B. Network configuration and troubleshooting	1+1	5	Static and dynamic IP, Private/Public Network, Device, Files and Printer Sharing
C. Spreadsheet and Word Processor	1+1	2	Working with data, data types and formulas, creating well formatted documents with standard practices
D. Database Design and SQL queries	1+1	3	Cleaned dataset, saved queries and results, pivot table and chart, data-quality note
E. Programming and web technology	1+1	3	Working program or web page with source code and sample output
F. Typing (Nepali and English)	1+1	2	Speed and accuracy of typing with punctuations
Total	**12**	**20**	

Task A - Computer hardware and operating system administration

Q1: Starting from an unplugged workstation, connect the power, monitor, keyboard, mouse and network cables, start the computer and log in. Record its processor, RAM, storage, operating system and IP address on the answer sheet.

Q2 : Install one application from an installer in the task folder and uninstall another named application. Then find and fix one simple seeded fault, such as a disabled network adapter, a stopped print service or a wrong date and time, and note the cause and fix.

Task B - Network configuration and troubleshooting

Q1 : Set a given static IP address, subnet mask, gateway and DNS, check it with ipconfig and ping, then switch back to automatic (DHCP) addressing. Classify four given IP addresses as private or public.

Q2 : Set the network as Private, turn on file and printer sharing, share a folder as read-only and share the installed printer (the built-in PDF printer is acceptable). The examiner checks access from another computer on the lab network.

Task C - Spreadsheet and word processor

Q1 : In a supplied sheet of about 20 records, set the correct data types and use formulas for total, average, Pass/Fail (IF) and a count (COUNTIF). Sort the data and format it to print on one page.

Q2 : Turn a supplied plain-text notice or letter into a well-formatted document, in Nepali Unicode or English, using heading styles, consistent fonts and spacing, a numbered list, a small table and page numbers. Save it as DOCX and PDF.

Task D - Database design and SQL queries

Q1 : From a short requirement, create two related tables with primary key, foreign key and NOT NULL constraints, and insert five records in each.

Q2 : On a supplied table of about 50 records, write four queries: filter and sort, count by group, join two tables, and find duplicate records. Save the queries and their results in one file.

Task E - Programming and web technology

Q1 : Write a short program in any available language (C, C++, Java, Python or PHP) that takes input, uses a condition and a loop, and prints a result, such as a marks total, percentage and Pass/Fail. Submit the source code and sample output.

Q2: Write a simple HTML page with a heading, a paragraph, a table, a link and a form with required fields, and open it in a browser.

Task F - Typing (Nepali and English)

Q1 : Type a printed English passage for 5 minutes in the word processor, with autocorrect and spell check turned off.

Q2 : Type a printed Nepali passage for 5 minutes in Nepali Unicode, using the Traditional or Romanized layout.

Marking: Net speed is the words typed minus errors, divided by 5 minutes; each wrong, missing or extra word or punctuation mark counts as one error. Award marks in proportion to net speed against a target fixed before the examination (suggested 30 net words per minute in English and 20 in Nepali)

Administration: Use one workstation image for all candidates, with internet off and the lab network on. Give every candidate the same task files (datasets, installers, documents and passages), record the seeded faults on a confidential examiner sheet, and reset each workstation, unplugged for Task A, between candidates. Candidates save their work to a named folder collected at the end, and examiners score against checklists, accepting equivalent tools and languages.

Physical cabling and CCTV skills are assessed through the theory (Area III MCQs and the Area I long-answer question, which requires a BoQ of tools and materials) and the interview. A short hands-on termination check can be added if the selection committee wants direct observation.

6. Structured Interview (10 Marks)

Table 5

Structured Interview Criteria

Criterion	Marks
Technical problem-solving and field experience	2
Infrastructure planning and resource judgment	2
Communication and user support	2
Teamwork, vendor coordination and adaptability	2
Integrity, data confidentiality and accountability	2
Total	**10**

Use the same core competency-based questions for all candidates and score independently against predetermined behavioural anchors. Ask for concrete examples of prior work, such as an outage the candidate resolved, a cabling or CCTV job they planned, or a dataset they cleaned.

7. Examination and Quality Standards

- **MCQs:** four options, one best answer, with correct responses evenly distributed across A/B/C/D; calculators are not allowed in the MCQ section.
- **Negative marking:** deduct 20% of a mark for each wrong MCQ answer and nothing for an unanswered one, as in Public Service Commission examinations; announce the rule in the vacancy notice.
- **SAQs:** two compulsory applied questions worth 5 marks each - one on databases (Area IV) and one on programming, web or information systems (Area V).
- **LAQ:** one compulsory case-based question worth 10 marks on network troubleshooting or expansion (Area I), requiring a diagnosis or design, a BoQ of tools and materials (cabling, devices and CCTV where relevant), and justification.
- **Question form:** a subjective question may be set as one question, two or more parts, or two or more short notes.
- **Medium:** candidates may answer in Nepali, English or both.
- **Laws and policies:** questions follow the laws, rules and policies in force (as amended, repealed or added) three months before the examination date.
- **Cognitive levels:** 20% foundational knowledge, 50% application and 30% advanced analysis/problem-solving.
- **Vendor neutrality:** accept any correct equivalent command, device or software; give reference sheets where a vendor-specific interface is used in the practical.
- **Practical marking:** standardized workstation image, datasets and seeded faults; two independent examiners using checklists; blinded marking of submitted files wherever feasible.
- **Qualifying scores:** consider a minimum of 40% in the written theory to proceed to the practical, and 50% in the practical, subject to approved recruitment rules.

- **Moderation and review:** moderate questions for content validity, clarity, difficulty and consistency; keep answer keys, fault sheets and rubrics confidential; review this curriculum every two years as technology changes.

8. Suggested Qualifications and Experience

Minimum academic qualification: Bachelor's degree in BSc CSIT, BSc IT, BIT, BIM, BCA, Computer Engineering, Electronics (Communication/Information) Engineering, or an equivalent ICT degree from a university recognized by Tribhuvan University, with one year of experience in a relevant field.

Desirable: hands-on experience in network administration, structured cabling, CCTV installation or EMIS/CMS data work; a networking certification such as CCNA, CompTIA Network+, MTCNA or an equivalent vendor certification.