Syllabus for the Chief Technical Assistant

(*Computer, Electronics Engineering*)

S.N.	Paper	Question Format	Full Marks	Number of Questions	Exam Time
1.	**Paper I**	Aptitude Test (Objective)	20	20	20 minutes
		Core Course (Objective)	30	30	30 minutes
2.	**Paper II**	Core Course (Theory + Practical)	80 + 20	8	3hrs
Total Written Exam Full Marks:			**150**		

Chief Technical Assistant
(*Electronics Engineering*)
(Detail Syllabus)

Paper I:	Objective (Core Course + Aptitude Test)	Marks: $1 \times 50 = 50$

Unit	Area of Questions	Number Questions
1.	Electronic Devices and Circuits	5
2.	Digital Electronics	4
3.	Microprocessor and Computer Architecture	4
4.	Power Electronics Communication Systems	4
5.	Instrumentation and Control Computer Networks and Data Communications	4
6.	Programming	4
7.	Measurement, Repair, and Maintenance	5
8.	TU Laws 2049, TU Teacher and Officers Service laws (2050) (Section 5,6,9, and 10), TU Economic Management and Procurement laws (2050) (Section 12, 13 and 14)	10
8.	General ICT Knowledge and Recent Trends, Nepal Constitution (Section 2, 3,7,8,9,11,13,14,17,18 and 20)	5

9.	Meaning of voltage, current, resistance, capacitance, inductance and power, Use of volt-meter, ammeter, watt-meter, and multi-meter, Concept of conductors and insulators, working of switches, fuse, MCB, earthing, Working and installation of basic electrical household appliances and wiring	5

1. Electronic Devices and Circuits

1.1. P- and N-type semiconductors and their conductivity

1.2. Operation, characteristics, and applications of diodes

1.3. Diode as half-wave, full-wave, and bridge rectifier (PIV); rectification efficiencies

1.4. Filters: Shunt capacitor filter, series inductor filter, and LC filter

1.5. Zener and avalanche breakdown

1.6. Operation, characteristics, and applications of FET

1.7. Operation, characteristics, and applications of Bipolar Junction Transistors (BJT)

1.8. Operation, characteristics, and applications of MOSFET

1.9. Operation, characteristics, and applications of thyristors

1.10. Operation, characteristics, and applications of TRIAC

1.11. Types and operation of power amplifiers

1.12. Oscillator characteristics

1.13. Relaxation oscillator and sinusoidal oscillator

1.14. DC circuits and single-phase AC circuits

1.15. Operation of step-up and step-down choppers

1.16. Uninterruptible Power Supplies (UPS)

2. Digital Electronics

2.1. Number systems and conversions

2.2. Arithmetic logic operations

2.3. Logic gates and Boolean functions

2.4. Logic simplification

2.5. Arithmetic circuits

2.6. Multiplexers and demultiplexers

2.7. Encoders and comparators

2.8. Latches and flip-flops

2.9. Counters and shift registers

2.10. Decoders, display devices, and associated circuits

2.11. Combinational and sequential logic circuits

2.12. Logic family classification and its characteristics

2.13. Operation of standard TTL and CMOS (NAND, NOR gates)

2.14. Analog-to-digital (A/D) and digital-to-analog (D/A) converters

2.15. Memory organization and classification of semiconductor memories: ROM, PROM, EPROM, EEPROM, RAM

2.16. Programmable logic devices: PROM as PLD, programmable logic array (PLA), programmable array logic (PAL), Field Programmable Gate Array (FPGA) and its general architecture

3. Microprocessor and Computer Architecture

3.1. Stored program concept

3.2. Instruction cycle and timing diagrams

3.3. 8085/8086 microprocessor addressing modes and instruction set

3.4. Basic computer architecture and design of microprogrammed control units

3.5. RISC and CISC, pipeline, and vector processing

3.6. Computer arithmetic, serial and parallel input/output

4. Communication Systems

4.1. Digital and analog signals

4.2. Analog and digital carrier modulation/demodulation principles

4.3. Analog and digital communication systems and their advantages

4.4. Elements of a basic electronic communication system

4.5. Noise in communication systems and its types

4.6. Types of electronic communication: Simplex, Duplex (full/half)

4.7. Modulation principles and techniques: Amplitude modulation (AM), frequency modulation (FM), and pulse modulation

4.8. Digital carrier modulation techniques: Amplitude, frequency, and phase shift keying (ASK, FSK,

PSK) and Quadrature Amplitude Modulation (QAM)

4.9. Antennas and their parameters

4.10. Characteristics and applications of different types of antennas

4.11. Information theory and Shannon-Hartley channel capacity theorem

4.12. Source and channel coding theories

4.13. Optical fibers, types, and construction

4.14. Multimode and monomode fibers

4.15. Losses in optical fiber cables

4.16. Characteristics of light sources used in optical communication

4.17. Optical fiber systems

4.18. Wireless communication and cellular concepts

4.19. Multiple access techniques for wireless communication

4.20. Mobile communication systems

5. Computer Networks and Data Communications

5.1. Analog and digital communication

5.2. Network architecture and hardware/software

5.3. OSI and TCP/IP models

5.4. Network devices: Repeater, Hub, NIC, Bridge, Switch, Router, Gateway

5.5. Physical layer, Data link layer

5.7. LAN architectures and standards

5.8. Network layer, Transport layer

5.10. Application layer

5.11. Network security

6. Programming

6.1. Programming language fundamentals

6.2. Input / Output, Operators and expressions

6.4. Control structures/statements

6.5. Arrays, pointers, and functions

6.6. Structure and data files

6.7. Introduction to object-oriented programming (OOP)

6.8. Classes and objects, Data hiding

6.10. Inheritance and abstraction

6.11. Operator overloading

6.12. Exception handling

7. Measurement, Repair, and Maintenance

7.1. Overview of safety measures during maintenance

7.2. Preventive and corrective maintenance

7.3. Fault diagnosis techniques using basic flow charts

7.4. Measurement methods and types of instruments

7.5. Multimeters and voltmeters

7.6. Cathode-ray oscilloscope (CRO)

7.7. Signal generators and analysis instruments

7.8. Working principles of logic probes, logic pulsers, and logic analyzers

7.9. Measurement of power

7.10. Installation, troubleshooting, and repair of:

Power supply, UPS/Inverters, Battery chargers, Voltage stabilizers, Printers and scanners, Routers and switches

7.11. Mobile handset repair and maintenance

7.12. Assembly, maintenance, troubleshooting, and repair of computers

7.13. OS installation and troubleshooting

7.14. Network cable making

7.15. Network installation and troubleshooting

8. General ICT Knowledge and Recent Trends

8.1. Windows operating system

8.2. Application software (word processors, spreadsheets, presentations)

8.3. Internet and web, Computer viruses and antivirus

8.5. 4G/LTE/5G networks and applications

8.6. AI, Blockchain, IoT, and Machine Learning fundamentals

Paper II:	Core Course	Marks: $10 \times 8 = 80$

Subjective Knowledge

S.N.	Area of Questions	No of Questions
1.	Unit 1 : Electronic Devices and Circuits	1
2.	Unit 2: Digital Electronics	1
3.	Unit 3: Microprocessor and Computer Architecture Unit 6: Programming	1
4.	Unit 4: Communication Systems	2
5.	Unit 5: Computer Networks and Data Communications	1
6.	Unit 7 : Measurement, Repair, and Maintenance	1
7.	TU Laws 2049, TU Teacher and Officers Service laws (2050) (Section 5,6,9, and 10), TU Economic Management and Procurement laws (2050) (Section 12, 13 and 14)	1
8.	Practical (20 Marks)	