Syllabus for the Post of Assistant Professor

(*Electrical Engineering, Computer Engineering, Electronics Engineering***)**

S.N.	Paper	Question Format	Full Marks	Number of Questions	Exam Time
1.	**Paper I**	**Section A :** Aptitude (Objective)	50	50	50 minutes
		Section B: Core Course (Objective)	50	50	50 minutes
2.	**Paper II**	Core Course, Research, and Teaching-Learning (Subjective)	100	10	3hrs
Total Written Exam Full Marks:			**200**		

Paper I: Section A: Aptitude Test (Objective) Marks: 1 × 50 = 50

S.N.	Area of Questions Aptitude Test	Number Questions	Details
1.	Teaching and Communication Aptitude	15	Objectives and Perspectives, Essential Qualities for Higher Education, Teaching Rolls: Individual, Social, and Professional, Teaching Methods, Student Evaluation and Assessment
2.	Research Aptitude, Publication Ethics, and Data Interpretation	15	Definition and Importance of Research, Objectives, Types, and Methods of Research, Research and Publication Ethics, Data Sources, Accessibility, Availability, and Presentation. Research-Based Articles, Journal Quality, Dissertation/Thesis Framework
3.	Information and communication Technology	10	Benefits and Risk, Use of ICT in teaching-Learning and research, Virtual Learning Platforms, Digital Education Resources, Tools and Applications
4.	Higher Education System, Tribhuvan University	10	Higher Education Policy 2076, Tribhuvan University Acts, Laws, and Bylaws

Assistant Professor

(*Electronics Engineering*)

(Detail Syllabus)

Paper I: Section B: Core Course (Objective) Marks: 1 × 50 = 50

Unit	Area of Questions	Number Questions
1.	Electric Circuits	5
2.	Electronic Devices and Circuits	5
3.	Digital Logic, Microprocessor and Computer Organization & Architecture	4
4.	Electromagnetics, Propagation & Antenna	4
5.	RF and Microwave Engineering	4
6.	Filter Design	5
7.	Communication Systems and Telecommunications	5
8.	Wireless Communications	4
9.	Programming (Procedural & Object Oriented)	5
10.	Computer Networks and Security	4
11.	Signal Processing	5

1. **Electric Circuit**
   - 1.1. DC circuits, Basic Laws: Ohm's law, Kirchoff's law
   - 1.2. Network Theorems: Superposition theorem, Thevninn's theorem, Norton's theorem, Maximum power transfer theorem
   - 1.3. Passive components, Resistance, Inductance & Capacitance in electric circuits
   - 1.4. Single phase AC circuits and Power in AC circuits
   - 1.5. Transient analysis in RLC circuits
   - 1.6. Signal sources, voltage and current sources, controlled sources: VCVS, CCVS, VCCS, CCCS
   - 1.7. Measurements and Transducers
2. **Electronic Devices and Circuits**
   - 2.1. Diodes, Transistors, MOSFETs
   - 2.2. Amplifiers, Operational amplifiers and Oscillators
   - 2.3. Instrumentation and Isolation amplifiers
   - 2.4. Log/Antilog circuits, A/D and D/A converters
   - 2.5. Rectifier, Unregulated and Regulated power supplies

2.6. Linear regulators and Switched regulators
2.7. Power electronics: Diac, Triac, SCR
2.8. Inverters and Choppers

3. Digital Logic, Microprocessor and Computer Organization & Architecture

3.1. Number Systems, Basic Logic Elements, Combinational Logic Circuits, Arithmetic Circuits
3.2. Sequential Logic, Counters, Registers, Shift registers
3.3. State machines, Design procedure, State table and State diagram
3.4. Intel 8085 and 8086 microprocessors: architecture, programming and interfacing
3.5. Addressing modes
3.6. Interfacing with Memory and I/O devices
3.7. Memory devices and hierarchies
3.8. Interrupt system in microprocessors
3.9. Representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle and execution cycle
3.10. Microprocessor based instrumentations, Parallel/Serial interfacing with microprocessor based systems
3.11. CPU structure and function, Arithmetic and Logic Unit and Control Unit
3.12. Von Neumann and Harvard architecture, RISC & CISC architecture
3.13. Memory system, Cache memory and Cache mapping
3.14. Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, DMA
3.15. Pipelining
3.16. Multiprocessors and Multicore architecture

4. Electromagnetics, Propagation & Antenna

4.1. Electric field, Magnetic field, Maxwell Equations, Wave equation and wave propagation, Transmission Lines, Wave Guides
4.2. Radiation and Antenna Fundamentals
4.3. Antenna Parameters and Classification
4.4. Optical fiber and Propagation of signal through optical fiber

5. RF and Microwave Engineering

5.1. RF and Microwave Transmission Lines
5.2. RF/Microwave Components and Devices
5.3. Microwave Generators, RF Design Practices
5.4. Microwave Antennas and Propagation, RF/Microwave Measurements

6. Filter Design

6.1. Filter and its importance, ideal and practical filter
6.2. Butterworth, Chebyshev, Inverse Chebyshev, Elliptic and Bessel Thomson response
6.3. Frequency transformation
6.4. Properties and synthesis of passive one port, two port and resistively terminated networks

6.5. Active filter and design of active filters using cascaded biquads and active simulation of passive filter using inductor simulation, FDNR and Leapfrog simulation

7. Communication Systems and Telecommunications

7.1. Modulation and its importance in communication
7.2. Distortion, Noise and Interference
7.3. Analog modulation and demodulation: AM, FM and PM
7.4. Digital modulation: ASK, FSK, PSK, DPSK, QPSK, QAM
7.5. Basic blocks of Analog / Digital communication
7.6. Pulse modulation systems, Baseband digital communication
7.7. Error control coding techniques: Parity, Checksum, CRC, Hamming code, Convolution code
7.8. Switching and Multiplexing in telecommunication systems, FDM, TDM, SDM, OFDM
7.9. Digital Telephone Exchange and Switching, ST, TS, STS and TST switch, SS7 signaling

8. Wireless Communications

8.1. Concept of wireless communications and cellular mobile communication
8.2. Radio wave propagation in mobile network environment
8.3. Modulation-Demodulation methods in mobile communications
8.4. Equalization and diversity techniques
8.5. Speech and channel coding fundamentals
8.6. Multiple Access in Wireless communications
8.7. Wireless systems and current standards

9. Programming (Procedural & Object Oriented)

9.1. Programming with C, C++
9.2. Keywords, Identifiers, Data types, Preprocessor Directives, Operators and Statements
9.3. Input/Output, Control statements
9.4. Procedure/Functions, Array, String and Pointer
9.5. Structure and Union, File handling,
9.6. Objects and Classes, Operator Overloading
9.7. Encapsulation, Inheritance, Polymorphism, Template

10. Computer Networks and Security

10.1. Computer networks, Different types of networks and Applications of networks
10.2. Physical layer, Transmission media, Data Encoding Techniques
10.3. Data Link Layer and its services, Addressing, Error control and Flow control, Multiple access protocols, CSMA/CD, CSMA/CA, Hubs, Bridges and Switches
10.4. Network Layer and its services, IP addressing, IP, ICMP, ARP protocols, Router and its functions, Routing principles, Classification of Routing Algorithms, Routing Protocols: RIP, OSPF and BGP
10.5. Transport Layer and its functions, Multiplexing & Demultiplexing, Flow Control and Error Control, TCP and UDP

10.6. Application Layer protocols and functions, HTTP & HTTPS, FTP, DNS, SMTP, POP, IMAP
10.7. Network Security and its importance, Traditional Ciphers
10.8. Symmetric Encryption, DES, AES
10.9. Asymmetric encryption, Diffie and Hellman algorithm, RSA Algorithm
10.10. Cryptographic Hash Functions, MAC, Digital Signature
10.11. IDS and IPS

11. Signal Processing

11.1. Signal and its types, System and its types
11.2. Linear time invariant (LTI) system and its properties
11.3. Fourier series and Fourier transform and their properties
11.4. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT)
11.5. Structures of FIR and IIR
11.6. Design of IIR and FIR filters

Paper II: **Core Course** **Marks: $10 \times 10 = 100$**

Subjective Knowledge, Research, and Teaching-Learning Questions

S.N.	Area of Questions	No of Questions
1.	**Unit 2:** Electronic Devices and Circuits	1
2.	**Unit 3:** Digital Logic, Microprocessor and Computer Organization & Architecture	1
3.	**Unit 4:** Electromagnetics, Propagation & Antenna **Unit 5:** RF and Microwave Engineering	1
4.	**Unit 6:** Filter Design	1
5.	**Unit 7:** Communication Systems and Telecommunications	1
	Unit 8: Wireless Communications **Unit 11:** Signal Processing	1
6.	**Unit 9:** Programming (Procedural & Object Oriented)	1
7.	**Unit 10:** Computer Networks and Security	1
8.	Research Methodology, and Applications; Problem - Solving	1
9.	Teaching Learning and Student Evaluation; Syllabus Structure (Bachelors and Masters, TU)	1