

# Nepal Telecom

## Nepal Doorsanchar Company Ltd.

### Syllabus

#### Paper Second (Specialized subject for Electronics and Communications Engineer Level 7 Open competition)

Time: 2 hours

Full Marks: 100

Pass Marks: 40

All the Questions are Compulsory

Types of question	Number of questions	Marks	Total Marks	Remarks
Objective Questions	30	1	30	1/4 marks will be deducted for each incorrect answer
Short Questions	10	4	40	
Long Questions	3	10	30	
			100	

Use of non-programmable calculator is permitted in the examination hall.

#### 1. **Electronic Devices and circuit (Weightage 5%-15%)**

Bipolar transistors switching characteristics, MOS transistor switching characteristics, TTL logic circuits, NMOS/CMOS logic circuits, Memory: RAM, DRAM, PROM, EPROM, Operational amplifiers, Butterworth and Chebysev filters, A/D Converters, Adders, Arithmetic operations, Digital comparators, Parity check generator, Multiplexer & Demultiplexers, Flipflops, Shift register, Counters, Sequence generators, Power electronics: Thyristor, Controlled rectifier circuits, 7 segment display, Untuned amplifier, Push-pull amplifier, tuned power amplifiers, Feed back amplifiers, bode plot analysis, Wien bridge oscillators, tuned LC oscillators, resonant circuits, crystal oscillator.

#### 2. **Electromagnetic field and waves (Weightage 5%-15%)**

Coulomb's law and Electric field intensity, Electric Flux Density and Gauss' law, Maxwell's first equation and application, divergence theorem, energy & potential, Laplace equation and Poisson equation, Biot-Svart's law, Ampere's circuital law, Curl, Wave motion in free space, Perfect dielectric and losses, Wave medium, Skin effect, Impedance matching, Antenna fundamental, Polarizations, Radiation from dipole antenna, wave guides and mixtures.

#### 3. **Control system (Weightage 3%-7%)**

Open loop and closed loop control system, System Stability and Sensitivity, System transfer functions and responses, Poles and Zeros locations and their significance, Root locus method, Frequency response method.

#### **4. Signal Analysis and Processing (Weightage 5%-15%)**

Information theory, Shannon-Hartley law, Transmission of signals, Impulse response and convolution, Fourier series, Fourier Transform, Unit step, Delta, Sinc & Signum function, Helbert transform, LTI system, System described by Differential & Difference equations, FIR & IIR Filters, Discrete Fourier Transforms, IDFT, FFT, Circular convolutions, Parseval's theorem, Energy & power and auto correlation, Z transform.

#### **5 Basic Analog and Digital Communications (Weightage 15%-25%)**

Difference between analog and digital communications, Basic communications elements, Signal and noise in communication system, AM, DSC-SC, SSB-SC, PM, FM, Super heterodyne AM and FM receiver, Digital to analog and analog to digital conversion, Sampling theorem, Sample & hold Circuit, A law,  $\mu$ -law, Quantizer, Coding: NRZ/HDB3/AMI, Error detection and correction, PCM/ADPCM, Digital Modulation: ASK/PSK/FSK /QPSK /MSK / QAM, Modulation and demodulation circuits, Frequency converter and Mixers, Phase locked loop

#### **6 Telecommunications and advanced communications (Weightage 15%-25%)**

Evolution of telecommunications, Telecommunication network, Transmission media, transmission lines, characteristic impedance, Return loss, transformer and hybrid circuit, signal and noise measurements, echo & singing, space/time/frequency/wave length division multiplexing, Erlang B formula, Queuing theorem, Data communication and computer networking basics, Packet, Message and circuit switching, X.25 Protocol, Frame relay, TCP/IP Protocol, OSI layers, Telephony, Functions of switching, electromechanical switches, Stored Programmed Controlled switch, TS/ST/TST/STS switching, No 5 and No 7 signaling, ISDN, BISDN, ATM, PDH/SDH, DSL, Radar system, Navigational systems, Numbering, Routing and charging plans. UMTS, IMT-2000, NGN (Next Generation Network), MPLS, Real time protocol, Voice over IP, IP/PSTN Platform, Introduction to IN(Intelligent Network), basics of GIS (Geographical Information System).

#### **7. Optical Communication (Weightage 5%-15%)**

Total internal reflection, Snell's law, Optical Fiber types and properties, optical transmission, Optical transmitters and receivers, Interconnected and switched; splices, connectors & coupling, Fiber Optics Networks, Optical switching, Submarine cable.

## 8 Wireless Communications (10%-20%)

Evolution from 1G to 3G, Propagation theory, LOS (Line of Sight) & Non-LOS model, Okumura and Hata Model, GMSK, OQPSK, BPSK, FDMA/TDMA/CDMA technologies (DECT, GSM, CDMA 2000-1x), Fundamental of satellite communication, stabilization, tracking, satellite orbit and radio spectrum, satellite wave propagation and satellite antennas, Digital satellite communication systems, earth stations, Kepler's laws of orbital motion, signal to noise ratio, interference between different wireless systems.

### द्रष्टव्य :

१. प्रश्नहरू अंग्रेजी तथा नेपाली दूवै वा कूनै एक भाषामा मात्र पनि सोध्न सकिनेछ ।
२. प्रश्नहरू सैद्धान्तिक, ब्यवहारिक र विश्लेषणात्मक किसिमबाट सोधिनेछन् ।
३. परीक्षार्थीहरूले अंग्रेजी वा नेपाली मध्ये कूनै एक वा दूवै भाषामा उत्तर दिन सक्नेछन् ।
४. प्रश्नहरूसंग सम्बन्धित ऐन, नीति, नियम तथा प्रचलित नेपाल कानूनहरू (नेपाल दुरसञ्चार कम्पनी लिमिटेडसंग सम्बन्धित समेत) मा परीक्षा मिति भन्दा तीन महिना अघिसम्ममा संशोधन भई कायम रहेका व्यवस्था लागु हुनेछ ।
५. यथासम्भव सबै शिर्षकहरूलाई समेट्ने गरी प्रश्नहरू सोधिनेछन् ।