

नेपाल विद्युत प्राधिकरण

प्राविधिक सेवा, इलेक्ट्रिकल समूह, इलेक्ट्रोनिक्स उपसमूह, तह-७, इन्जिनियर पदको
खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम
प्रथमपत्र- सेवा सम्बन्धी ज्ञान (१०० पूर्णाङ्क)

१. लिखित परीक्षाको विषय, पूर्णाङ्क, परीक्षा प्रणाली, प्रश्नसंख्या, अंकभार र समय निम्नानुसार हुनेछ ।

पत्र	विषय	पूर्णाङ्क	उत्तिर्णाङ्क	परीक्षा प्रणाली		प्रश्न संख्या	प्रति प्रश्न अंकभार	समय
प्रथम	सामान्यज्ञान तथा सेवा सम्बन्धि सामान्य विषय	१००	४०	क) सामान्यज्ञान र बौद्धिक परीक्षण	वस्तुगत बहु बैकल्पिक प्रश्न	२५	२	२ घण्टा
				(ख) सेवासम्बन्धी सामान्य विषय	छोटो उत्तर आउने प्रश्न	१०	५	
द्वितीय	सेवा सम्बन्धी	१००	४०	विषयगत	लामो उत्तर आउने प्रश्न	१०	१०	३ घण्टा

- वस्तुगत प्रश्नमा प्रत्येक प्रश्नका चार वटा सम्भाव्य उत्तर दिइने छ । जस मध्ये एउटा सही उत्तरमा (लोकसेवा आयोगले तोके बमोजिम) चिन्ह लगाउने वा लेख्नु पर्नेछ । गलत उत्तर बापत प्रति गलत उत्तर २० प्रतिशतका दरले अंक घटाइनेछ ।
- प्राविधिक सेवा अन्तर्गतका सबै समूह/उपसमूहहरूको प्रथम पत्रको पाठ्यक्रम एउटै हुनेछ । प्रथम पत्रको लिखित परीक्षा सबै समूह/उपसमूहका लागि संयुक्त रूपमा एउटै प्रश्नपत्रबाट एकैदिन वा छुट्टाछुट्टै प्रश्नपत्रबाट छुट्टाछुट्टै दिन हुन सक्नेछ ।
- प्रथमपत्र र द्वितीयपत्रको परीक्षा फरक फरक हुनेछ । द्वितीय पत्रमा २ खण्डहरू हुनेछन् । प्रत्येक खण्डको लागि फरक फरक उत्तर पुस्तिका प्रयोग गर्नुपर्नेछ ।
- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी वा दुवै हुन सक्नेछ ।
- सामान्यतः प्रत्येक इकाईबाट प्रश्नहरू सोधिनेछन् । प्रत्येक इकाईको अंकभार तोकिए बमोजिम हुनेछ । लामो उत्तर दिनुपर्ने प्रश्न एकै वा खण्ड खण्ड गरी (हुइ वा सो भन्दा बढी) सोध्न सकिनेछ । यस्तो प्रश्न एक भन्दा बढी इकाईबाट पर्ने गरी सोध्न सकिनेछ ।
- यस पाठ्यक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- परीक्षामा कालो मसी भएको कलम वा डटपेन मात्र प्रयोग गर्नुपर्नेछ ।

प्रथमपत्र: सामान्य ज्ञान तथा सेवासम्बन्धी सामान्य विषय (प्राविधिक सेवा, तह-७ का सबै समूहका लागि)

खण्ड (क): सामान्य ज्ञान र बौद्धिक परीक्षण

[५० अंक]

१. सामान्यज्ञान :

(१५×२=३०)

- नेपालको भूगोल र आर्थिक तथा सामाजिक कृयाकलाप: धरातलीय स्वरूपको किसिम र विशेषता, नेपालमा पाईने हावापानीको किसिम र विशेषता, नदीनाला, तालतलैया, खनिज पदार्थ, प्राकृतिक स्रोत साधन, विद्युत, शिक्षा, स्वास्थ्य र सञ्चारसम्बन्धी जानकारी
- नेपालको सामाजिक एवं सांस्कृतिक अवस्था: प्रथा, परम्परा, धर्म, जातजाति, भाषाभाषी, कला, संस्कृति र साहित्य
- नेपालमा विद्युत विकास, ऊर्जाका श्रोत र सम्भावना
- नेपालको संघीय, प्रादेशिक र स्थानीय संरचना तथा शासन प्रणालीसम्बन्धि जानकारी

- ड) विश्वको भूगोल: महादेश, महासागर, अक्षांश, देशान्तर, अन्तर्राष्ट्रिय तिथि रेखा, समय, पर्वतश्रृंखला, नदी, हिमनदी, ताल, हिमताल
- च) अन्तर्राष्ट्रिय सम्बन्ध तथा संघ/संस्था: संयुक्त राष्ट्र संघ र यसका एजेन्सीहरू (UNO and Its Agencies, दक्षिण एशियाली क्षेत्रीय सहयोग संगठन (SAARC) सम्बन्धी जानकारी
- छ) राष्ट्रिय तथा अन्तर्राष्ट्रिय महत्वका समसामयिक घटना तथा नविनतम गतिविधिहरू

२. बौद्धिक परीक्षण:

२.१ Verbal and Non-verbal Aptitude: (१०x२=२०)

Vocabulary, Alphabetical ordering of words, Classification, Coding-Decoding, Insert the missing character, Direction and Distance sense test, Ranking order test, Relationship Test, Logical sequence of words, Common sense test, Assertion and Reason, Logical reasoning, Figure series, Figure analogy, Figure Classification, Figure Matrix, Pattern completion/finding, Construction of squares and triangles, Analytical reasoning.

२.२ Numerical Ability and Quantitative Aptitude :

Arithmetical reasoning, Insert the correct mathematical signs, Decimal and Fraction, Percentage, Ratio, Average, Profit and Loss, Time and work.

खण्ड (ख): सेवासम्बन्धी सामान्य विषय (५० अङ्क)

1. Constitution, Act and Rules 3*5= 15

- 1.1. Present Constitution of Nepal
- 1.2. Nepal Electricity Act, 2041
- 1.3. Nepal Electricity Authority, Present Employee Service by laws
- 1.4. Electricity Regulatory Commission Act, 2074
- 1.5. Electricity Act, 2049 and Electricity Regulation, 2050
- 1.6. Public Procurement Act, 2063
- 1.7. Nepal Electricity Authority, Present Financial Administration by laws
- 1.8. Corruption Control Act, 2059
- 1.9. Good Governance (Management and Operation) Act, 2064
- 1.10. Land Acquisition Act, 2034
- 1.11. Environment Protection Act, 2053 and Environment Protection Regulation, 2054

2. Electricity Development in Nepal 2*5= 10

- 2.1. History of power development in Nepal; energy supply demand trends
- 2.2. Recent trends in power sector reform; Hydropower potential of Nepal and prospects and challenges for its development
- 2.3. Nepal Electricity Authority: objective, functions, corporate structure, achievement and challenges
- 2.4. Concept of NEA Restructuring in federal context
- 2.5. Silent features of energy crisis decade by government of Nepal

3. Development 1*5= 5

- 3.1. General concept of development administration
- 3.2. Planning in Nepal: efforts, achievement and challenges
- 3.3. Sustainable Development
- 3.4. Public Private Partnership

4. Management and financial analysis: 2*5= 10

- 4.1. Concept of Management
- 4.2. Motivation, Leadership, Control, Coordination and Team work, Decision making
- 4.3. Corporate planning and strategic management
- 4.4. Corporate social responsibility
- 4.5. Project management: Use of network models like CPM, PERT, manpower planning and resource scheduling; project monitoring and control; project control cycle

- 4.6. Financial analysis: Methods of financial analysis such as benefit cost ratio, internal rate of return, net present value, payback period, minimum attractive rate of return and their application; Concept of EIRR and FIRR; tariff structure

5. New Trends of Power Sector

2*5= 10

- 5.1. Various Sources of Energy: trend, Possibilities and challenges
- 5.2. Role of IPP (Independent Power Producer), opportunities and challenges
- 5.3. Power Purchase Agreement (PPA), Power development agreement (PDA)
- 5.4. Concept of Energy Pool Market and Energy Banking
- 5.5. Regional and sub regional interconnections with Nepalese grid

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खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम
द्वितीय पत्र: सेवा सम्बन्धी ज्ञान (१०० पूर्णाङ्क)

खण्ड क: (५×१०=५० अंक)

1. Electric Circuits and Semiconductor devices

Electric Circuits: Circuit elements, series and parallel circuits, RLC circuits, resistor color coding, Kirchhoff's laws, single phase and 3 phase circuits, power and energy in AC circuits, transfer functions; frequency response of networks; fourier series transient and steady state response

Semiconductor Materials: Intrinsic & extrinsic semiconductor devices, impurities, doping, p & n type semiconductor, majority and minority charge carriers, theory of PN junction

Semiconductor Devices: Diodes (PN junction diode, ideal diode, zener diode, LED, photo diode, tunnel diode, varactor diode, Schottky diode); half- and full-wave rectifications, bipolar junction transistor (construction, operations, transistor configurations: CE, CB and CC configurations, transistor amplification action, small signal model around a dc operating point, load lines, Transistor modeling, different BJT dc biasing and small signal analysis, BJT Frequency response); field effect transistor (construction, characteristics, types of FET, Basic FET circuits), transistor switching circuits (TTL circuits, MOSFET switch, NMOS Circuits; CMOS Circuits), enhancement and depletion type MOSFETs

2. Logic Circuits and Digital Electronics

Number System: Decimal, binary, octal, hexadecimal, BCD numbering systems, and their conversions; ASCII and EBCDIC codes and their applications

Logic Gates: Basic gates: NOT, OR, AND; Universal gates: NAND and NOR; Exclusive gates: X-OR, X-NOR gates, laws and theorems of Boolean algebra, De'Morgan's theorems, K-map simplification and its applications

Combinational Logics: Half-Adder, full-Adder, N-bit adder, encoder, decoder, multiplexer, demultiplexer, ROM, PLA

Sequential Logic Circuits: Flip-flops, shift registers, counters: up/down counters, synchronous and asynchronous counters, modulus (mod) and decade counters, astable, monostable and bistable multivibrators and clock generation and applications

Digital Electronics: Bipolar transistor switching characteristics, MOS transistor switching characteristics, bipolar transistor logic families: RTL, DTL, TTL, I²L, ECL; NMOS logic circuits; CMOS logic circuits, memory, operating principle of different logic gates

3. Electronics Circuits

Operational Amplifier: Op-Amps characteristics, basic Op-Amp circuits and their applications, *BJT Amplifiers:* Class A, Class B, Class AB, Class C and Class D amplifiers and their circuits; classifications of amplifiers on the basis of coupling – RF, transformer, direct coupling amplifier; classifications of amplifiers on the basis of frequency – audio, RF and tuned Amplifiers

Oscillators: Feedback concepts, oscillation theory, relaxation oscillator, Colpitts, Hartley, Wien Bridge, LC, crystal oscillators, voltage controlled oscillator

Voltage Regulators and Power Supplies: Unregulated and regulated power supplies, voltage regulation, voltage reference, heat and power design, IC voltage regulators

4. **Communication system**

Analog Communication: Modulation, theory and generation of AM, DSB-SC, SSB, FM and PM; comparison between AM, FM and PM; AM, FM and PM transmitters/receivers; super heterodyne receiver; IF & RF amplifiers, automatic gain control (AGC), balanced slope detector, phase discriminator, ratio detector, FM stereo principle, equalizers, noise in analog communication systems, signal-to-noise ratio, carrier-to-noise ratio and analog communication system applications

Digital Communication: Digital technology, advantages of digital communication; principle of PAM, PWM, PPM and PCM; carrier systems: OOK, ASK, FSK, PSK, DPSK, Four Phase PSK and QAM techniques; fundamentals of data communications, noise in digital communication systems

Optical Fiber Communication: Advantages of optical transmission, optical spectrum, types of optical fiber cable, attenuation in optical fiber cable, joining of fibers-mechanical coupling and fusion splicing, laser diodes, photodiodes, attenuation measurements, operation and line supervision, optical fiber network in NEA

Power Line Carrier Communication (PLCC): Introduction and general theory, transmission channels, frequency range, modulation technique, carrier frequency generation, transmitting amplifier, pilot channel, demodulation, HF filter tuning, line equalization, PLCC system in NEA

Microwave Communication: Microwave transmission and reception, microwave triodes, klystrons, magnetrons, travelling wave tube amplifier (TWT), solid state power amplifier (SSPA)

Satellite Communication: Orbital dynamics and satellite launchers, types of satellites, geostationary and non-geostationary satellites, types of satellite orbits, transponders, ground segments, satellite link designs, propagation effects in satellite-earth link design, multiple access, VSAT systems and satellites applications

खण्ड ख (५×१०=५० अंक)

5. **Electromagnetic Fields, Transmission Lines and Antennas**

Electromagnetic Fields: Electrostatic fields in free space, Gauss's law in integral form and application (conductors, insulators and semiconductors), wave equations (polarization, wave impedance, skin effect, reflection and refraction at the interface between two media, standing wave ratio (SWR), impedance matching, quarter wave transformer)

Transmission Lines: Basic principles, fundamentals of transmission lines, characteristics impedance, types of transmission lines (coaxial cable, open wire, wave guide), equivalent diagram of transmission lines, matched and mismatched transmission lines, losses in transmission lines, standing waves, power and signal transmission capability of lines

Waveguides and Resonators: Theory and operation of waveguide, parallel plane, rectangular, circular, ridged and flexible waveguides; waveguide coupling, matching and attenuation; theory and operation of resonator

Antennas: Types, antenna gain, antenna resistance, bandwidth, beamwidth, polarization, directivity, effect of antenna height, dipole, dipole arrays, folded dipole; Yagi-Uda antenna, parabolic, horn, helical, microstrip antenna, helical antenna, disc and loop antennas, propagation in the radio frequency spectrum

6. **Microprocessor and Microcomputer**

Microprocessor: Registers, memory, and input/output, fundamental bus signals, importance of clock pulses, n-bit microprocessors, Intel microprocessor architecture

Assembly Language Programming: Assembler syntax, macro assemblers, cross assembler, implementation time of program

Internal Architecture of Basic Microprocessor: Internal resources of microprocessor – registers, data paths, control units and arithmetic and logic units, relation between RTL and assembly language

Interrupt Operations: Interrupt behavior, interrupt service routine requirements, interrupt priority, vectored, chained and polled interrupt structures, peripheral devices using interrupts, interrupt control system

Microcomputer: Building blocks of a microcomputer, RISC and CISC computers, operating systems, software system concepts, data communications concepts, ALU sub-system, memory sub-system, input/output subsystem, control unit, instruction cycle

7. Instrumentation and Control

Applied Electronics: Voltage summing, voltage buffer, switched mode power supply(SMPS), inverters, choppers, diode, thyristors, triac, controlled rectifier circuits, Darlington pair, wave shaping circuits, active filters, phase lock loops, Op-Amp practical uses, timer IC 555 applications, microcontroller based systems

Instrumentation: Instrumentation systems, theory of measurements (static performance – accuracy, precision, sensitivity, resolution and linearity, dynamic Performance – response time, frequency response, bandwidth and errors in the measurements), types and applications of various transducers

Measurement Transducers: Temperature, light level, strain and displacement, acceleration, pressure, force, velocity, magnetic field measurement, thermocouples

Digital to Analog Conversions: A/D and D/A conversions

Output Devices: Indicators, meters, strip chart recorder, magnetic tape recorders

Component Modeling and Linearization: Differential equations and transfer functions, state space formulation, fluid, fluidic and thermal system components, linearized approximation of non-linear characteristics

System Transfer Functions and Responses: Combinations of components to physical systems, system reductions, laplace transform, steady state equilibrium system,

Stability: characteristic equation, complex plane interpretation of stability, root locations and stability, Root Locus Method, frequency response method, performance specifications for control system

8. Electronic Construction and Safety Engineering

Prototyping methods: Breadboards, PC prototyping boards

Printed Circuits: PC board fabrication, PC board designs, CAD/CAM

Safety and Precautions: Safety rules and regulations, storage and handling of explosives, compressed gases and flammable substances, safety and precautions in case of hazards

Earthing and Shielding Techniques: Fire hazards, fire fighting techniques and equipment

Noise Hazards: Sources of noise, control of noise and its effect on health, first aid requirements for after the event treatment.

The end