निजामती कर्मचारी अस्पताल

प्राविधिक सेवा, अटोरिनोल्यारिङ्गोलोजी समूह, अटोरिनोल्यारिङ्गोलोजी उपसमूह, अडियोलोजिष्ट पद, छैठौं तहको खुला तथा आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :– लिखित परीक्षा (Written Examination) पूर्णाङ्क :– २००

द्वितीय चरण :– अन्तर्वार्ता (Interview) पूर्णाङ्क :– ३०

प्रथम चरण (First Phase) : **परीक्षा योजना (Examination Scheme)**

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या X अङ्क	समय
प्रथम	Technical Subject	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न	५० प्रश्न x २ अङ्क	४५ मिनेट
द्वितीय		१००	४०	विषयगत		१० प्रश्न X १० अङ्क	३ घण्टा

द्वितीय चरण (Second Phase)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्य :

१. यो परीक्षा योजनालाई प्रथम चरण (लिखित परीक्षा) र द्वितीय चरण (अन्तर्वार्ता) गरी दुई चरणमा विभाजन गरिएको छ ।

२. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।

३. प्रथम र द्वितीय पत्रको पत्रको विषयवस्तु एउटै हुनेछ ।

४. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।

५. परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा तोकिए अनुसार हुनेछ ।

६. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।

७. वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital letter) A, B, C, D मा लेख्नुपर्नेछ । सानो अक्षर(Small letter) a, b, c, d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।

८. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।

९. विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरुको हकमा १० अङ्कको एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरु (Short notes) सोध्न सकिने छ ।

१०. विषयगत प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।

११. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्क्रममा परेको सम्झनु पर्दछ ।

११. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।

१२. पाठ्यक्रम लागू मिति :–

यो पाठ्यक्रम मिति २०७९।०९।१८ बाट लागू गरिएको छ ।

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यो पाठ्यक्रम मिति २०७९।०९।१८ बाट लागू गरिएको छ ।

निजामती कर्मचारी अस्पताल

प्राविधिक सेवा, अटोरिनोल्यारिङ्गोलोजी समूह, अटोरिनोल्यारिङ्गोलोजी उपसमूह, अडियोलोजिष्ट पद, छैठौं तहको खुला तथा आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

Paper I and II: Technical subject

Section (A): 50 % Marks

1. **Introduction to Audiology**
   - 1.1 Origin of Audiology, its growth & development.
   - 1.2 History, growth & development of Audiology in Nepal.
   - 1.3 Scope of Audiology and branches of audiology
   - 1.4 Acoustics of sound, Sound measurements, dB concept and binaural hearing, Psychoacoustic principles, methods & applications. Tuning fork test, Hearing loss-causes, types, classification, degree, pattern of hearing loss, neo-natal screening, need of early identification, Development of auditory system, auditory behaviors at different age, High risk register, Genetics & Associated syndromes related to hearing and balance.
   - 1.5 Define frequency and intensity. Physical and Psychophysical scales, Equal loudness contours, Frequency weighting curves, combined sources, Pitch and Timbre. Fourier analysis of complex tones.
   - 1.6 Power and pressure formulae: zero dB reference for pressure and power.
   - 1.7 Relationship between phones and sones.
   - 1.8 Use of phone and sone.
   - 1.9 Use of phone and sonograph.
   - 1.10 Theories of hearing.
   - 1.11 The effects of Head Shadow and Pinna Shadow.
   - 1.12 Special role of hearing in visual impaired.
   - 1.13 Curve for threshold of hearing MAP and MAF.
   - 1.14 Concept of masking, Factors affecting Hearing Evaluation, Formal and Informal Testing, Use of different stimuli in Hearing test, Types of Audiograms.

2. **Introduction to Speech & Language Pathology**
   - 2.1 Normal speech language development, Neuro-anatomy related to speech and language, Theories and models of language acquisition.
   - 2.2 Articulation & Phonology: Normal development, Models of phonological development.
   - 2.3 Articulation & Phonological disorder- assessment procedures & management approaches.
   - 2.4 Cleft lip & palate and glossectomy: Definition, etiology, clinical features, assessment and management approaches.
   - 2.5 Voice disorders and Laryngectomy: Definition, etiology, clinical features, differential diagnosis, assessment and management approaches.
   - 2.6 Fluency disorder: Definition, normal development, theories of fluency development, differential diagnosis of fluency disorders, assessment and management in adult and children.
   - 2.7 Adult motor speech disorders: Dysarthria and Apraxia- Definition, etiology, clinical features, differential diagnosis, assessment and management approaches.
   - 2.8 Childhood Motor Speech Disorders: Cerebral Palsy, Dysarthria, Apraxia, DOS-Definition, etiology, classification, clinical features, assessment and management approaches.
   - 2.9 Normal swallowing & Dysphagia.
   - 2.10 Childhood Communication Disorder: Definitions, etiology, classification and characteristics of communication disorders in children with Hearing

Impairment, Intellectual disability, Autism Spectrum Disorder, ADD and ADHD, SLI and LLD, Learning disability, Acquired Childhood Aphasia, Multiple impairments.

2.11 Aphasia: Definition, etiology, classification. Other Neuro-communication disorders: Definition, causes, types/classification, Assessment and Treatment-RHD, Dementia, Primary Progressive Aphasia, Sub-cortical Aphasia, TBI.

2.12 Communication, Language and Speech Intervention: General intervention approaches and principles. Specific intervention techniques, AAC, Role of parents, caregivers and family and team approach. Counseling- meaning, scope, principles, types in context of speech & language impairments

2.13 Epidemiology & Prevention of Speech, Language & Hearing Disorders.

2.14 Code of Ethics, Legislative support for rehabilitation- prepare policy, disability act. Empower parents, person with disabilities and community, Vocational training. Strategies for awareness, public education and information.

3. **Basic Medical Sciences Related To Speech & Hearing**

3.1 General Anatomy and physiology: Neuron, synapse, reflex action, bioelectrical phenomena, action potential, depolarization, nerve fibers and synapses. Division and functions of the nervous system. Normal anatomy of the brain, its divisions, general lobes, Broadmann's areas and vascular supply of brain. Reticular formations, basal ganglia, cerebellum, circle of Willis, spinal cord and its structure. Blood brain barrier. Cerebrospinal fluid – formation & flow. Reflex action and common reflexes. Congenital cerebral and cranial defects. Capillaries, arteries, veins, cardiac cycle, and aneurysm. Vascular shock – its reference to aphasia / speech disorders. Bones of the skull; parts of a temporal bone. Properties of muscles. Muscles of the neck, face and tongue.

3.2 Anatomy & physiology of respiratory system: Mechanism of respiration – internal and external influence, nervous control – vital capacit – tidal volume, residual air, efficiency tests of respiration, artificial respiration. Types of breathing. Explain hypoxia, asphyxia and cyanosis.

3.3 Embryology: The development of branchial arches and pouches and their derivatives. The development of face and its developmental anomalies. The development of palate and correlate with cleft lip and cleft palate. The development of tongue and thyroid gland and correlate with developmental anomalies. The development of external ear, middle ear and inner ear and correlate with developmental anomalies.

3.4 Endocrinology: Define hormone and their functions; regulation of secretion of hormone and its influence in voice disorder. Hormonal controls and changes at puberty. Hypothyroidism and its effect on voice.

3.5 General Pathology, Genetics & immunology: Define inflammation, infection, and tumor – benign & malignant, tissue healing. Normal structure of chromosome and define karyotyping. Structural and numerical aberrations of chromosome. Significance of medical genetic, its importance in diagnosis and management of Speech & Hearing disorders. General outline of immunology related with speech and hearing.

4. **ENT: Anatomy, Physiology and Diseases**

4.1 **Ear:** Otology - Anatomy & physiology of external, middle & inner ear. Ascending and descending auditory pathways, vestibular pathway. Mechanism

of hearing: peripheral and central. Functions of utricle, saccule and vestibular apparatus in relation to posture and equilibrium. Tests for posture and equilibrium. Diseases of the external, middle and inner ear leading to hearing loss: congenital malformations, traumatic lesions, infections, neoplasm, Keratosis obturans, foreign bodies, wax, etc. diseases of the middle ear – different types of otitis media namely acute otitis media, otitis media with effusion and its sequelae, chronic otitis media & complications, otosclerosis, neoplasms, eustachian tube disorders and their management. Diseases of the inner ear such as labyrinthitis, Meniere's disease, prebyacusis, ototoxicity, and noise induced hearing loss, sudden SNHL, BPPV, vestibular neuronitis, differential diagnosis of vertigo and their management. Other causes of hearing loss – tumors of the cerebello- pontine angle, vestibular schwannoma. Causes and management of tinnitus. Pseudohypoacusis, ANSD, CAPD, Tinnitus, Vestibular, Assessment & Management.

4.2 **Nose:** Rhinology- Anatomy & physiology nose, paranasal sinuses. Congenital diseases of nose – cleft lip, cleft palate, choanal atresia. rhinolalia, rhinosinusitis, deviated nasal septum, sinonasal polyposis.

4.3 **Oral cavity & Pharynx:** Anatomy & physiology of oral cavity, oropharynx, nasopharynx, laryngopharynx. Disorders of oral cavity, nasopharynx, oropharynx, and laryngopharynx and their effect to causes of speech disorders. Diseases of the tonsils and adenoids. Normal structure and function of esophagus mechanism of swallowing. Esophageal conditions: Gastroesophageal reflux disorder, congenital abnormality – atresia, Tracheo-oesophageal fistula, Stenosis, short oesophagus. The muscles of palate in terms of their origin, insertion, actions, blood supply and innervations.

4.4 **Larynx:** Laryngology- Anatomy & physiology of larynx, muscles of larynx in relation to their attachments, actions and innervations; mention the blood supply of larynx. Structure and function of vocal cords and physiology of phonation. Difference between an infant and an adult larynx disorders of laryngeal structure – laryngomalacia, laryngeal web, subglottic stenosis, posterior laryngeal cleft, tumors and cysts. Laryngitis: acute laryngitis, acute laryngotracheobronchitis, acute epiglottitis, laryngotracheal diphtheria, specific laryngitis. Causes, management of chronic laryngitis. Identify Vocal cord polyps, Reinke's Edema, Vocal nodules. Neuromuscular dysfunctions of the larynx – vocal cord palsy, spastic dysphonia. Differential diagnosis of hoarseness. laryngectomy, oesophageal speech, tracheo oesophageal puncture, artificial larynx.

Section (B): 50 % Marks

5. **Basic Acoustics and Electronics**

5.1 Basic Acoustics: Vibrating systems (Simple Complex vibrations, Vibration spectra); Waves and Resonance of a mass-spring vibrator; Sound Pressure, Power and Loudness, Pitch, Timbre and Acoustics of Rooms.

5.2 Basics of electricity and Electronics - concept of DC (direct current) and AC (alternating current), voltage, electrical energy and power. Safety and precautions from electric hazards, grounding concept.

5.3 Basic electronic device and its applications – Diode and its applications-rectification, switching, Varycap, LED, Photodiode, photocell. Power supply-Block diagram, circuit diagram, working principle. Transistor (BJT) and its

application-Amplification, Oscillation, Switching, Logic function. FET and MOSFET and its application and advantages. Power Electronic devices- DIAC, TRIAC explanation and application. Microelectronics-Analog and digital integrated circuits, microprocessor, microcomputers, microprocessors, micro-controllers

5.4 Microphones as transducers - Definition, basic characteristics of Microphone; basic characteristics and application of Moving Coil Microphone-schematic diagram and working principle; basic characteristics and application of Condenser Microphone-schematic diagram and working principle; other types of microphones and its application-crystal microphone, magnetic microphone, ribbon microphone, electrets microphone

5.5 Loudspeakers as transducers - Dynamic loudspeaker (cone type) -Schematic diagram, working principle, characteristics, applications; Horn speaker-principle, applications; Baffles and enclosures and its applications; Multi-speaker systems-2 and 3 Way speaker network; Loudspeaker efficiency, quality

5.6 Recording and Reproduction of sound - concept of Audio Gramophone recording; Audio Magnetic Recording concept, recording block diagram, working principle and characteristics; Audio optical recording-compact disc, block diagram, working principle and characteristics; Audio digital recording-ADC (analog to digital sound conversion), DAC(digital to analog sound conversion), RAM memory; Sound compression and formats-MPEG-1, MPEG-3, DVD; stereophonic sound, multi-dimensional sound, HI-FI sound characteristics and HIFI sound reproduction systems, dynamic sound; Noise and distortion in sound recording and reduction methods- Dolby Amplifier and Hearing aid; Basic single and multistage stage amplifiers: simple circuit, coupling, decoupling function, amplification power, distortion, noise; Basic power amplifiers and its types: simple circuits and characteristics

5.7 Hearing aids and earphones: simple circuit, working principle, basic factors of designing hearing aid; analog and digital Multi-meter, Audio generator, Function Generator, Frequency counter meter, Oscilloscope (Demonstration and handling); Sound Level Meter, Spectrum Analyzer, Distortion Analyzer, Level Recorder; Sound analyzing soft-wares, voice recognizing techniques, digital signal processing (DSP)

5.8 Noise in the environment: types and sources. Effects of Noise

5.9 Noise - Induced Hearing Loss (NIHL) Acoustic Trauma: Incidence/prevalence, Audiological and Otological characteristics.

5.10 Instruments: Sound Level Meter (SLM) - types, parts and functions - Digital, Nondigital, portable, system settings for different types of measurements. Transducers, Noise Dose Meters, Analyzers, recorders, read-out devices. Purpose, utility and requirements.

5.11 Instrumentation and procedure for indoor and outdoor measurements of ambient noise, traffic noise, air-craft noise, community noise, and industrial noise.

5.12 Ear Protective Devices (EPDs): Properties of EPDs: Attenuation, Comfort, And Durability. Evaluation of attenuation characteristics of EPDs. Implementation for effective use of EPDs.

6. **Linguistics, Human Communication, Speech-Language Development and Disorders**

6.1 Linguistics : Introduction, branches and scope

6.2 Language : Nature, properties and functions of language
6.3 Communication : Nature and types
6.4 Phonetics and phonology, phone, phoneme and allophone.
6.5 Branches of phonetics and fundamentals of acoustic phonetics.
6.6 Speech production process: Initiation, phonation, articulation.
6.7 Classify speech sounds: Segmentals and suprasegmentals.
6.8 Interdependency and interrelation between communication, speech & language.
6.9 Distribution of sounds and principles of phonemic analysis with reference to Nepalese languages. Distinctive features and its application in articulatory disorders.
6.10 Syllables: Structure and types. Role of syllables in defining vowels, consonants, dipthongs and semivowels. Define morphology, morph, morpheme and allomorph. Morphological analysis: inflection and derivation.
6.11 Word and its types, Processes of word formation.
6.12 Semantics, Syntax and Pragmatics
6.13 History and development of the profession of Speech- Language Pathology (SLP) specifically in Nepal, neighboring countries and abroad.
6.14 Mechanism of speech and language production
6.15 Different models of Speech production.
6.16 Developmental stages of speech and language.
6.17 Definition, etiology, characteristics, classification and impact of: Hearing Impairment, Mental Retardation, Cerebral palsy, Seizure disorders and assessment procedures, differential diagnosis and management in brief.
6.18 Definition, etiology, characteristics and classification of: Autism Spectrum Disorders/ Pervasive Developmental Disorders. Attention Deficit Disorder/ Attention Deficit Hyperactivity Disorder. Assessment procedures, differential diagnosis and management.
6.19 Definition, etiology, characteristics, classification and impact of: Specific language Impairment, Learning Disability, Acquired aphasias in childhood, Traumatic Brain Injury in childhood. Assessment procedures, differential diagnosis and management.

7. **Diagnostic Audiology and Hearing Techonolgies/Aids**

7.1 Audiological test battery: Administering & Interpreting - Pure-tone air and bone conduction testing, Play audiometry, Speech audiometry, Electrophysiological test, Vestibular test, Site of lesion test, Tests for Functional Hearing Loss.
7.2 Speech audiometry tests: Speech Awareness Threshold (SAT), Speech Recognition Threshold (SRT), Speech. Identification Score (SIS), Most Comfortable Level (MCL), Uncomfortable Level (UCL) and Dynamic Range (DR). Materials for each of these tests. Role of Masking for SRT and SIS. Role of Speech Audiometry in differential diagnosis. Merits and demerits of Speech Audiometry.
7.3 Historical perspectives and usefulness of Difference Limen Tests, Bekesy Audiometry, Short Increment Sensitivity Index (SISI), Loudness Balance Tests - ABLB, MLB, Tone Decay Test, STAT.
7.4 Automatic Audiometry
7.5 Terminology and principle of Immittance Audiometry and Instrumentation.
7.6 Tympanometry – multi frequency and multi component.
7.7 Pseudo-hypoacusis: Terminologies, incidence and causes of Pseudohypoacusis

7.8 Historical development of hearing aids/ technologies: Non-electrical hearing aids, Electric hearing aids.
7.9 Hearing aid components and their function: Microphone, Amplifier, Receiver, Digital Circuits, Tone Controls and Filters, Telecoils, Bone Conductors, Batteries
7.10 Types of hearing aids: Body level, ear level (BTE, ITE, ITC, CIC, IIC), Spectacle (AC/BC); importance of Monaural Vs Binaural Vs Pseudobinaural. Use and importance of Directional hearing aids, modular hearing aids
7.11 Extended low frequency amplification, frequency transposition, amplification devices and systems
7.12 Concept regarding Routing of signals, head shadow/baffle/diffraction effects.
7.13 Signal enhancing technology
7.14 Electro-acoustic Characteristics & measurements for hearing aids
7.15 Standard measurement procedures & specifications of electro-acoustic characteristics of hearing aids according to ISI, IEC and ANSI
7.16 Digital hearing aids, Master hearing aids.
7.17 Hearing Aid selection
7.18 Hearing aids, Implantable Devices and Assistive Devices - Classification/Types, Electro-acoustic Measurement, Selection/candidacy, Programming, Ear-mold.

8. **Paediatric Audiology**
8.1 Development of the auditory system in children and auditory behavior at different stages.
8.2 Behavioral Observation Audiometry (BOA): Conditioning Techniques including CORA, VRA and its modifications, TROCA, Play audiometry.
8.3 Speech Audiometry in Children. Speech Recognition Tests including VASC, WIPI; NuChip, Glendonald Auditory Screening Procedure (GASP), Early Speech Perception Test (EST), Speech tests developed in Nepal and other countries. Electrophysiological Tests. Evoked Response Audiometry

9. **Psychology related to Speech and Hearing**
9.1 Role of clinical psychology in speech and hearing disorders.
9.2 Concept of normality and abnormality, models of mental disorders, biological, psychological, social models.
9.3 Stages of Emotional and Social development of a child

10. **Aural Rehabilitation**
10.1 Need / goals, approaches in aural rehabilitation, effect of hearing loss, integration and educational placement.
10.2 Auditory training & its method, speech reading.
10.3 Classroom amplification devices, adults & geriatrics rehabilitation, home training and counseling-meaning, scope, principles, types in context of hearing impairment.

11. **Audiological setup:** sound treated room, equipment used, Calibration, repair and maintenance, international standards for audiometric setup, instrument and testing.

12. **Legislations related to noise**
    - 12.1 DRC - Definition: historical aspects; Use of TTS and PTS: Information in establishing DRC, CHABA; AFR 160-3 AAOO, ASAZ. Damage Risk Contours Walsh - Healy Act. OSHA, DRC for impulse noise.
    - 12.2 Claims for hearing loss: Fletcher point eight formula; 1947, AMA method; AAOO AMA formula, California variation of AAOO formula.

13. **Research Methodology and Biostatistics**
    - 13.1 Introduction about Biostatistics, variables, data, population sample, parameter statistics, scales of measurement. Data collection, Classification & Presentation of data.
    - 13.2 Descriptive statistics: Statistics of location, Mean Median Mode, Geometric mean, Range, Statistics of Dispersion, Mean Deviation, Standard Deviation, Coefficient of Variation. Correlation & Regression.
    - 13.3 Basic concepts of research designs.
    - 13.4 Sampling Statistics: Sampling & Sampling Distribution, Sampling Errors & sampling statistics, Standard errors, Degree of freedom, Types of Sampling. Probability Distribution
    - 13.5 Experimental Design: Controlled and uncontrolled experiment, Sampling types, Sample size & pilot experiment, Single factor experiment & Factorial experiment-example, Analysis of variance (ANOVA).
    - 13.6 Applications: Collection, presentation and analysis of hospital statistical data with examples.
    - 13.7 Proposal writing and report writing.