CURRICULUM
ON
MASTER LEVEL
CENTRAL ENTRANCE EXAMINATION

FACULTY OF SCIENCE AND TECHNOLOGY

POKHARA UNIVERSITY

2020

Pokhara University
Faculty of Science and Technology
Central Entrance Examination Curriculum
Master of Science in Transportation Engineering and Management / Master of Science in
Structural Engineering / Master of Science in Hydropower Engineering / Master of Science in
Public Health and Disaster Engineering

Total marks: 150   Qualifying marks: 75 (Paying)/53(Scholarship)
Time: 3 hrs

Entrance curriculum mainly covers common topics of all streams covering Fundamental of
Mathematics, Transportation Engineering, Structural Engineering, Water Resources Engineering,
Environmental Engineering content related to Bachelor of Civil Engineering and equivalent with
some general knowledge.Entrance curriculum mainly covers common topics of all streams
covering related subject contents of bachelor in Civil Engineering and equivalent.

Section	Course	Weightage (%)
A	Fundamental of Mathematics	25
B	Transportation Engineering	25
C	Geotechnical Engineering	15
D	Structural Engineering (Applied Mechanics, Strength of Materials, Structural Analysis, Design of Steel and Timber, Design of RCC structures, Concrete Technology and Masonry Structures)	15
E	Water Resources Engineering (Fluid Mechanics, Hydraulics, Hydrology, Irrigation, Hydropower)	10
F	Environmental Engineering (Water Supply and Sanitation)	10
	Total	**100**

Section A: Fundamental of Mathematics

1. Basic of Set, Basic of Differential and Integral Calculus, Vector Algebra and Calculus:

Set and functions, limit, continuity and differentiability of functions, Curvature, Integration by
using different integration techniques, Application of derivative and Antiderivative, Ordinary
Differential Equations, Vectors and scalars, resolution of vectors, scalar and vector product of
two and more vectors.

2. Linear Algebra, Analytic Geometry and series:

Definition and basic properties of matrices and determinants Rank of matrix, system of linear
equations, inverse of a matrix, Conic Section, Parabola, Fourier series on the functions of period
2π.

3. Introduction of Descriptive Statistics and Numerical Methods:

Presentation and classification data frequency distribution, histogram, measures of central tendency: mean, median, mode, quartiles and percentiles, measures of dispersion (variability).

Section B: Transportation Engineering

1.   Traffic Engineering:

Traffic volume, parking, speed, accident study, Traffic characteristics, Traffic control devices, Highway capacity, Street lighting, intersection design

2.   Highway Design:

Geometric design of highways: design criteria, Design of cross-sections, vertical and horizontal alignment, Hill roads

3.   Pavement design and construction:

Traffic consideration, Design procedures for Flexible and rigid pavement, Road Construction activities: Preparations of sub-grade for cut and fill embankment section, Construction of flexible pavement, Construction of rigid pavement

Section C: Geotechnical Engineering

Soil Mechanics:
- Introduction, phase relations and index properties of soil and soil identification and its classification
- Principle of effective stress, capillarity and permeability on soil :- total stress, pore water pressure and effective stress; capillary phenomenon in soils, capillary head and capillary pressure; quick sand condition; total pressure and elevation heads; permeability of soil and its determination
- Compaction, compressibility and consolidation of soil:- process of compaction and compaction theories, moisture density relationship and degree of compaction, effect of compaction on engineering behavior of soils; Normally consolidated and over consolidated soils
- Shear strength of soil and Slope stability: - Mohr-circle, normal, shear and principal stresses; determination of shear strength parameters; stress path
Foundation Engineering:
- Site investigation: - Methods of soil exploration; boring, sampling, soil sampling, types of sample, soil sampler; field penetration test; plate load test, number of bore holes, depth of exploration,
- Lateral earth pressure theories, earth retaining structure and coffer dam:- types of earth pressure; Rankine's, Coulomb's, Culmann's earth pressure theories
- Bearing capacity and settlement of shallow foundation:- modes of soil failure; theories of bearing capacity; effect of water table; bearing capacity from in-situ-test; plate load test
- Mat foundation, pile foundation, well foundation:- floating foundation; bearing capacity and settlement of mat foundation; classification, use and selection of pile foundation;

determination of pile load capacity; group action of pile and efficiency; negative skin friction; type, shape, component and depth of well foundation

Section D: Structural Engineering

Applied Mechanics and Strength of Materials
- ➢ Resolution and composition of forces
- ➢ Resultant of force and moment for a system of force
- ➢ Moment of inertia of composite and built up section
- ➢ Position, velocity and acceleration of a particle and rigid body
- ➢ Rectilinear and curvilinear motion of particles
- ➢ Rectangular components of velocity and acceleration
- ➢ Equations of Motion, Motion due to central force and dynamic equilibrium
- ➢ Centroids of composite and built up section
- ➢ Axial loading, normal stress, normal strain and Hooke's law
- ➢ Transverse loading, shear stress, shear strain and their relationship
- ➢ Deformation of axially loaded bars, Temperature effect
- ➢ Analysis of axial force, shear force and bending moment diagrams for plane frame
- ➢ Beams of uniform and symmetric cross section in pure bending

Structural Analysis, Design of RCC Structures and Design of Steel and Timber Structures
Structural Analysis:
- ➢ Static and kinematic indeterminacy of 2D and 3D structures
- ➢ Displacement of structures by strain energy method, unit load method, castigliano's method, integration method, conjugates beam method, moment area method
- ➢ Determination of maximum and absolute maximum shear force and bending moment using ILD method
- ➢ Analysis of cable and arch
- ➢ Analysis of indeterminate structures by consistent deformation method and matrix method

Design of RCC Structures:
- ➢ Codal provisions for RCC structural design.
- ➢ Analysis and design of singly and doubly reinforced section, Flexural design, Shear design
- ➢ Detail analysis and design of one way and two-way slabs,
- ➢ Detail analysis and design of columns
- ➢ Detail design of footings

Design of Steel and Timber Structures:
- ➢ Analysis of bolted and welded joint
- ➢ Design concept of tension and compression member (LSM)
- ➢ Stiffened and unstiffened steel beam (LSM)
- ➢ Elements of Plate Girder
- ➢ Analysis and design of truss (LSM)

Concrete Technology and Masonry Structures
- ➢ Introduction of concrete and its ingredients
- ➢ Mix design methods (Nominal, DOE and IS standard design methods)

- ➢ Properties of fresh and hardened concrete
- ➢ Durability of concrete
- ➢ Design of load bearing walls under vertical load
- ➢ Non-destructive tests of masonry units and elements

Section E: Water Resources Engineering (Fluid Mechanics, Hydraulics, Hydrology, Irrigation Engineering and Hydropower Engineering

Physical properties of fluid, Pressure, Equilibrium stability of floating bodies, Fluid kinematics, Classification of fluid flow, Dynamics of flows, Eulers equation, Bernoulli's equation, Navier stokes equation, Boundary layer theory, Momentum equation, Open channel flow, Uniform and Non uniform flow, Energy & momentum principle for open channel flow, Flow in mobile boundary channel, Flow over notches & weirs, Gradually varied flow, Hydraulic Jump; Hydrologic cycle, Precipitation, Hydrological losses, Surface runoff, Rainfall-runoff correlation, Streamflow, Measurement of flow Hydrograph Analysis, Unit hydrographs, Peak flow estimation; Status irrigation development in Nepal, Irrigation water requirements, Surface and sub-surface Irrigation methods Canal types, Design of canals, Irrigation structures, River training, Waterlogging; History and status of hydropower development in Nepal, Principle, common terms and advantages, Components of hydropower plant, Hydropower potential, Classifications of hydropower plant, Water Conveyance Structures, Dam, Spillways, Energy Dissipators, Hydro-mechanical and Electro-mechanical equipment (Turbine, pumps, generator), Micro-hydropower

Section F: Environmental Engineering (Water Supply and Sanitation)
Drinking Water: Introduction to pollutants (sources, types and effects), sources and characteristics of water, water demand and quantity, estimation of future population, design period. Present status of Water Supply and Sanitation, Current issues and problems of Water Supply in rural and urban, Design norms and principles, Principles related to unit operation: Aeration, Flocculation and coagulation, Sedimentation process including course material removal, Filtration process/Slow sand filtration /Rapid filtration, Disinfection process.

Wastewater: Sources and nature of wastewater, wastewater characteristics (BOD, COD aerobic and anaerobic decomposition), Principles related to unit operation: Physical treatment: Screen /Grit chamber /Gas chamber /Mixing /Sedimentation /Flocculation /Floatation, Chemical treatment: Chemical precipitation, Absorption, Ion exchange, Electrolysis, Biological treatment: Aerobic and Anaerobic process, Aerated lagoons, Activated sludge, Trickling filters, Oxidation ditches, Sludge treatment: Drying, Dewatering, Filtration, Centrifugation, Chemical conditioning (immobilization), and Incineration.