

Manmohan Technical University
 Service Commission
 Curriculum of Open Competitive Examination
 For the Post of Lecturer in **Civil/ Geotechnical Engineering**

Description of the post:

Service: Teaching	Group: Civil Engineering
Post: Lecturer, Civil/ Geotechnical Engineering	Level: Lecturer

Framework of the Curriculum:

The examinations are conducted in two phases as mentioned below:

First Phase: Written Exam	Full Marks: 150
Second Phase: (a) Qualification, Publications and Teaching Experience:	Full Marks: 50
(b) Interview & Presentation:	Full Marks: 50

Table No: 1

First Phase: Written Exam Full Marks: 150

Paper	Subject	Full Marks	Pass Marks	Examination System	Number of Questions	Time
First	Teaching, Research and General Knowledge	50	25	MCQs	20	50 Minutes
	Subject Related Contents			MCQs	30	
Second	Subject, Research and Teaching Related Contents	100	50	Subjective Questions (short & long answer type)	14	3 Hours

Table No: 2

Second Phase: Interview Full Marks: 100

Subject	Full Marks	Examination System	Remarks
Interview and Presentation	50	Oral and Very Short Presentation	
Evaluation of Documents	50	Observation and Marking	
Total	100		

Note:

1. This curriculum framework is divided into two phases.
2. Open/internal competitive examination will be held as mentioned above.
3. The medium of language in written exam will be Nepali or English or both Nepali+ English only.
4. Examinees are prohibited to take mobile phone, programmable calculator, smart watch or other similar electronics devices in the examination hall.
5. The marks of academic qualification, publications and teaching experiences in the concerned field will be evaluated before the time of interview. All the publications and related documents are to be submitted before the last date of application submission.
6. The marks are allotted for these documents as given below:

S. No	Documents	Full Marks
1	Academic qualification	30
2	Research publication	10
3	Teaching experience	10
Total		50

7. The final result will be published on the basis of total marks of written exam, interview/ presentation, evaluation of academic qualification, research publications and teaching experiences.
8. In a subjective question, one or more than one questions can be included within the allotted marks area.
9. The full marks and weightage of questions are based on the given curriculum.
10. Research and problem solving types of questions will be selected from the related field.
11. This curriculum will be effective from the date of 2080/05/13

Subject: Civil/ Geotechnical Engineering
Paper: First (Objective)
Objective (Multiple Choice) Questions

Full Marks: 50
Pass Marks: 25
Time: 50 Minutes

Part	Subject Matter	Number of Questions	Marks per Question	Total Marks
First Part	Teaching, Research and General Knowledge	20	1	20
Second Part	Subject Related Contents	30	1	30
Total		50		50

(Extention of the Curriculum) पाठ्यक्रमको विस्तृतीकरण

First Part: (Teaching, Research and General Knowledge)

20×1=20

क) शिक्षण सीप, विधि र विद्यार्थी मुल्याङ्कन (Teaching Skill, Methods and Evaluation): (5)

विस्तृतीकरण	उच्च शिक्षा शिक्षणका लागि आवश्यक गुण, संचार सीप, शिक्षण विधि र विद्यार्थी मुल्याङ्कन सम्बन्धी प्रश्नहरू ।
शीर्षक	थप विस्तृतीकरण
उच्च शिक्षा शिक्षणका लागि आवश्यक गुणहरू Required qualities for teaching in higher education:	उच्चशिक्षामा शिक्षणको लागि आवश्यक व्यक्तिगत, सामाजिक तथा पेशागत गुणहरू: (Required qualities for teaching in higher education: Individual, social and occupational/professional)
कक्षामा सञ्चार सीप (Communication Skill in the classroom)	सिकाइमा उत्प्रेरणा जगाउने तरिका र कक्षामा विषयवस्तुको प्रस्तुतीकरण सीप: (Motivational and presentation skills of subject matter in the classroom): भाषाको प्रयोग, विषयवस्तुको क्रमवद्धता, सिकारुमैत्री वातावरण निर्माण ।
शिक्षण विधि (Teaching methods)	शिक्षण विधिका अवधारणा र प्रयोग: (Concept and uses of teaching methods): <ul style="list-style-type: none"> • Demonstration method • Problem solving method • Discovery method • Project method • Practical /Experimental method • Field work method

विद्यार्थी मूल्याङ्कन (Student evaluation and assessment)	<ul style="list-style-type: none"> • सुधारात्मक, निर्णयात्मक तथा निदानात्मक मूल्याङ्कन (Formative, summative and diagnostic evaluation). • मूल्याङ्कनबाट प्राप्त जानकारीको प्रयोग (Using assessment information): निर्णय गर्नका लागि (For Decision making), सुधारका लागि पृष्ठपोषण (Feedback for improvement) ।
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(ख) Research Aptitude, Publication Ethics and Data Interpretation: (5)

Extention	<ul style="list-style-type: none"> • Meaning of research and its objectives, types and methods, • Research & publication ethics, • Types of data sources, access to data, availability of data and data presentation • Research based article, • Quality of journal • Dissertation/thesis framework
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(ग) उच्च शिक्षा प्रणाली (Higher Education System) (5)

विस्तृतिकरण	नेपालको संविधानमा शिक्षा संबन्धी प्रावधानहरु, नेपालको शिक्षा प्रणाली, नेपालमा उच्च शिक्षाको वर्तमान अवस्था, उच्च शिक्षा नीति ।
नेपालको संविधानमा शिक्षा संबन्धी प्रावधानहरु, नेपालको शिक्षा प्रणाली, नेपालमा उच्च शिक्षाको वर्तमान अवस्था, उच्च शिक्षा नीति ।	<ul style="list-style-type: none"> • नेपालको संविधानमा शिक्षा संबन्धी प्रावधानहरु: • नेपालको शिक्षा प्रणाली: शिक्षाको संरचना, औपचारिक र अनौपचारिक प्रणाली । • उच्च शिक्षामा प्राविधिक विषयको आवश्यकता • विश्वविद्यालय अनुदान आयोगका प्रमुख कार्यहरु तथा यसबाट विश्व विद्यालयहरुलाई दिइने अनुदानका प्रकार । • उच्च शिक्षा नीति ।

(घ) मनमोहन प्राविधिक विश्वविद्यालय र नेपाल इन्जिनियरिङ परिषद सम्बन्धी जानकारी (Information on Manmohan Technical University and Nepal Engineering Council) (5)

विस्तृतिकरण	म. प्रा. वि. ऐन, नियम तथा सांगठनिक स्वरुप सम्बन्धी प्रश्नहरु ।
<p>४.१ मनमोहन प्राविधिक विश्वविद्यालय ऐन, २०७६</p> <p>४.२ मनमोहन प्राविधिक विश्वविद्यालय शिक्षक तथा कर्मचारीको सेवाका सर्त र सुविधासम्बन्धी नियमावली, २०७८</p> <p>४.३ मनमोहन प्राविधिक विश्वविद्यालय शैक्षिक प्रशासन नियमावली, २०७८</p> <p>४.४ मनमोहन प्राविधिक विश्वविद्यालय सेवा आयोग सम्बन्धी नियमावली, २०७८</p> <p>४.५ नेपाल इन्जिनियरिङ परिषद ऐन २०५५ र नियमावली २०५७ (संशोधन सहित)</p>	

Subject: Civil/ Geotechnical Engineering
Paper: First
First Part: Teaching, Research and General Knowledge

Sample Questions (MCQs)

20×1=20

(20 MCQs are asked from the contents of First Part. Each question carries one mark.)

Tick the best answer for the following questions from the given alternatives:

1. In the context of higher education, which of the followings is the most important role of a good teacher?
 - A) An evaluator of students in the class
 - B) A guide liner, analyzer and synthesizer of related information effectively
 - C) Innovator and Creator
 - D) **Effective communicator**
2. Which of the following assessment techniques is used to evaluate a student's progress and give feedback?
 - a) Summative
 - b) **Formative**
 - c) Decisive
 - d) Diagnostic
3. Which one is not a part of research proposal?
 - a) Methodology
 - b) Objectives
 - c) **Recommendations**
 - d) References
4. Which one is not a tool of data collection in engineering education?
 - A) Campaigning**
 - B) Questionnaire
 - C) Focus group discussion
 - D) Participatory rural appraisal
5. The main mandate of the University Grants Commission (UGC) Nepal includes:
 - A) **Disbursing grants to universities and colleges**
 - B) Recognizing and monitoring technical institutions
 - C) Funding research centers in universities
 - D) Managing various scholarship programs
6. The main present structure of education in Nepal is:
 - a. Primary, secondary and higher level
 - b. Pre-primary, Primary, basic, secondary, Higher and Research level
 - c. Primary, Secondary, Higher and Research level
 - d. **Basic, secondary and Higher level**

7. Which of the following statements is the most appropriate in terms of online education?
- a. It supplements formal education
 - b. It reduces the cost of education
 - c. It replaces the formal education
 - d. It enhances access to education in low cost and short time.**
8. Which of the following officials is not a member of the academic council of MTU?
- a. Representative of the industrial institute
 - b. Teacher representative of MTU
 - c. Member of the service commission of MTU**
 - d. Representative from the subject specialist
9. In which of the following case salary is discontinued to a teacher if he/she should be punished?
- a. If he/she frequently denied the code of conduct of teacher
 - b. If he/she disclosed the secrecy of the university
 - c. If he/she has not got clearance of his/her advance amount taken from the MTU
 - d. If he/she frequently denied and neglected the appeals of stakeholders**
10. Which one of the following statements is true?
- a. Curriculum and syllabus are equivalent components.
 - b. Syllabus has a wide scope than curriculum.
 - c. Curriculum is a broad term and syllabus is a part of curriculum.**
 - d. Syllabus includes many activities as compare to the curriculum

Subject: Civil/ Geotechnical Engineering

Paper: First

Second Part: Subject Related Contents

30×1=30

Sample Questions

(30 MCQs are asked from the Contents of Group A of the Second Paper.
Each question carries one mark.)

Tick the best answer for the following questions selecting from the given alternatives:

1. Rise in water table above the ground surface causes
 - a. **Equal increase in pore water pressure and total stress**
 - b. Equal decrease in pore water pressure and total stress
 - c. Increase in pore water pressure but decrease in total stress
 - d. Decrease in pore water pressure but increase in total stress
2. Terzaghi's theory of one dimensional consolidation assumes
 - a. Soil is homogeneous and partially saturated
 - b. Water and soil particles are compressible
 - c. **Deformation of the soil is entirely due to change in volume**
 - d. Soil is not isotropic
3. Failure of slope occurs only when total shear force is
 - a. Equal to total shearing strength
 - b. **Greater than total shearing strength**
 - c. Less than total shearing strength
 - d. Less than pore pressure
4. The laboratory consolidation test is conducted with an apparatus called
 - a. **Consolidometer**
 - b. Impact testing machine
 - c. Compression testing machine
 - d. Flexural testing machine
5. Unconfined compressive strength test is
 - a. Drained test
 - b. **Undrained test**
 - c. Consolidated undrained test
 - d. Consolidated drained test

Subject: Civil/ Geotechnical Engineering

Paper: Second (Subjective)

Full Marks: 100
Pass Marks: 50
Time: 3Hours

Group: A

Knowledge of the Subject Matter and Its Analysis: 60

Questions on this part are included from the types as given below:

Question Types	Number of Questions	Per Question Marks	Total Marks
Long Questions	3	10	30
Short Questions	6	5	30
Total	9	-	60

1. Basic Civil Engineering Courses:

(15)

- 1.1 Surveying: Fundamental of Surveying, Linear Measurements, Chain Survey, Compass Survey, Leveling, Theodolite, Control Survey and its methods, Plane Table Survey, Computation of Area and Volume, Control Survey by Traversing Method, Trigonometric Leveling, Tacheometry, Contouring, Curve Surveying, Field Astronomy and Global Positioning System (GPS), Modern Method of Surveying, Geographic Information System (GIS) and Remote Sensing.
- 1.2 Engineering Drawing, Estimating, Costing and Valuation: Fundamentals of Standard drawing sheets, dimensions, scale, line diagram, orthographic projection, isometric projection/view, pictorial views, and sectional drawing. Procedure of Estimating, Building Estimates, Estimates of other Civil Engineering Structures, Specifications, Rate Analysis, Rules and Methods of Measurement of Works and Taking out Quantities, Abstract of Cost and Billing, Valuation of Civil engineering structures.
- 1.3 Engineering Mechanics: definitions, stress-strain diagrams, Hook's law, Poisson's ratio, allowable stress and safety factor, elastic constants and relationships, Torsions: definitions, assumptions, relevant formula, torsion moments and stress, modulus of rigidity, Geometric properties of sections: Axes of symmetry; center of gravity of different sections, moment of inertia, radius of gyration.

2. Research Technique, Soil Properties, Classification, Clay Mineralogy and Soil Water Interaction:

(5)

- 2.1 Historical development of geotechnical engineering
- 2.2 Tools and techniques to solve different geotechnical problems
- 2.3 Types of software to analyze geotechnical problems
- 2.4 Recent research trend in geotechnical engineering

- 2.5 Phase diagram, Basic definitions and their relationships
- 2.6 Index properties of soils, Determinations of various index properties
- 2.7 Soil classification: Textural, ISSCS, MIT, BSCS, USCS and AASHTO soil classification System
- 2.8 Field identification of soil, Application of soil classification systems
- 2.9 Treatment of clay soil for different load conditions, Clay minerals, Clay particle, Domain interaction, Clay structure and fabrics
- 2.10 Capillarity in soils, Permeability of soils, Coefficient of permeability: Laboratory and field methods
- 2.11 Types of head, seepage forces and quick sand conditions, Principle of effective stress
- 2.12 Flow nets, two dimensional flow, Seepage in anisotropic soil condition, Seepage through an earth dam on an impervious and pervious base
- 2.13 Flow through non-homogeneous sections, Preventions of erosion-protective filters, Dam failure preventions

3. Soil Compaction, Consolidation and Shear Strength of Soil: (10)

- 3.1 Laboratory Tests, Factors Affecting Compaction, Structure and Engineering behavior of compacted soils (for $\phi = 0$, $C = 0$, $C - \phi$), Compaction specification and field control
- 3.2 Coefficient of consolidation, One dimensional laboratory consolidation test, Void ratio pressure plots, Settlement calculation, Compression index and swell index, Secondary consolidation settlement, Time rate of consolidation, Calculation of consolidation settlement under a foundation, Method of accelerating consolidation settlement
- 3.3 Mohr-Coulomb failure criterion, Different laboratory tests for shear strength parameters, Stress path, Empirical relations between undrained cohesion and effective overburden pressure, Shear strength of sands, Shear strength models, Shear strength of partially saturated soil

4. Slope Stability and Stress Distribution in Soil Mass: (5)

- 4.1 Infinite slopes and translation slides, Finite slopes- forms of slip surface, $\phi = 0$ analysis (total stress analysis), $C - \phi$ analysis – method of slices, Location of the most critical circle of failure, Friction Circle Method, Taylors stability number, Bishops method of stability analysis, Use of stability coefficients
- 4.2 Boussinesq's theory, Isobar diagram, Vertical stress distribution on horizontal plane, Distribution of vertical stress on vertical Plane, Vertical stress due to line load, Vertical stress under the centre of strip load, Vertical stress under UDL on a circular area, Vertical stress under the corner of rectangular area, Vertical stress at any point under a rectangular area, Newmark's influence charts, Westergaard analysis, Approximate methods for vertical stresses determination, Contact pressure

5. Geotechnical Investigation, Earth Pressure Theory and Retaining Structures (10)

- 5.1 Methods of soil exploration, Planning the exploration programme, Method of boring, Soil sampling and soil samplers, Number and depth of borings, Field tests: SPT, DCPT, CPT, PMT, DMT, Ground water observations, Borehole logs
- 5.2 Effect of wall movement on earth pressure, Earth pressure at rest, Rankine's theory of earth pressure, Coulomb's theory of earth pressure, Graphical solution for Coulomb's earth pressure, Proportioning of retaining walls, Stability of retaining walls, Braced excavations, Earth pressure against bracings in cuts, Heave of the bottom of cut in soft clays, Strut loads, Cantilever sheet pile wall, Anchored bulkhead, Cofferdams

6. Bearing Capacity Analysis of Different Types of Foundations Ground Improvement: (10)

- 6.1 Principle modes of soil failure, Bearing capacity by classical earth pressure theory, Recent bearing capacity theories, Bearing capacity from In-situ tests, Plate load test, Types of settlement and their relationships, Allowable settlement and Allowable bearing pressure
- 6.2 Mat foundation, Types and uses of piles, Selection of pile type, Types of foundations to suit subsoil conditions, Pile driving, Static pile load formulae, Load test on piles, Group action of piles, Negative skin friction, Laterally load piles, Piles subjected to uplift loads, Well foundations
- 6.3 Mechanical compaction, Dynamic compaction, Preloading, Sand compaction piles and stone columns, Soil stabilization by use of admixtures, Soil stabilization by injection of Grouting

7. Project Planning, Design and Implementation: (5)

7.1 Project planning, scheduling and Project management: Project classifications; project life cycle phases; project planning process; project scheduling (bar chart, CPM, PERT); resources leveling and smoothing; monitoring, evaluation and controlling. Information system; project risk analysis and management; project financing, tender and its process and contract management.

7.2 Professional Practice and Regulatory Body: Environment and society; professional ethics; regulatory environment; contemporary issues/ problems in engineering; occupational health and safety; roles and responsibilities of Nepal Engineers Association (NEA), Act and Regulations of Nepal Engineering Council.

Group: B

Subject Related Research and Problem Solving: 20

Questions on this part are included from the types as given below:

Question Types	Number of Questions	Per Question Marks	Total Marks
Long Questions	2	10	20
Total	2		20

- 1. Research Aptitude, Publication Ethics and Data Interpretation: (10)**
Meaning of research and its objectives, types and methods, Research publication ethics, Process of data collection, availability of data and its presentation, Research based articles, Process of preparation and publication of qualitative journal and its framework, Dissertation/thesis framework, Analyze the existing problems and suggest solutions
- 2. Problems and Solutions in Related Field: (10)**
Identify problems, issues and challenges in related field, Latest trends, issues and challenges in the field of related Subject and suggest appropriate means and ways of solutions to overcome these issues

Group: C

Teaching Related Contents: 20

Questions on this part are included from the types as given below:

Question Types	Number of Questions	Per Question Marks	Total Marks
Long Questions	1	10	10
Short Questions	2	5	10
Total	3		20

- 1. Curriculum and Teaching Plans: (10)**
General information on curriculum, Analysis, suggestions and Preparation of Bachelor level curriculum of MTU in related subject and its frame work, General information, importance, preparation and implementation of instructional plan, unit plan and daily lesson plan
- 2. Teaching Skill, Methods and Evaluation: (10)**
Required qualities for teaching in higher level: Individual, social and occupational/professional, Communication Skill: motivation and presentation of subject matter in the classroom, Teaching methods: Demonstration method, Problem solving method, Discovery method, Project method, Practical/Experimental method, Field work method, Student Evaluation and Assessment: Formative, summative and diagnostic evaluation, Using assessment information for decision making and feedback for improvement

Subject: Civil/ Geotechnical Engineering

Paper: Second

Full Marks: 100

Pass Marks: 50

Time: 3 Hours

Sample Questions (long and short answer types)

Attempt all questions

Group: A (30+30=60)

Long answer type questions:

3×10=30

1. Briefly discuss the effects of drainage conditions on the shear strength parameters of a clay soil. Also discuss the factors which affect the shear strength parameters of soil. (10)
2. Discuss the various factors that govern the Sub-Soil exploration, bringing out the guiding principles for deciding the location of bore holes, in an engineering project. Also state the assumptions and theory of earth pressures due to (i) Rankine (ii) Coulomb. (10)
3. Discuss the necessity of ground improvement techniques. Explain what is meant by safe bearing capacity of soil. Indicate, how the bearing capacity of shallow footing in a given soil can be calculated from the strength characteristics of the soil? (10)

Short answer type questions:

6×5=30

4. How do weathering converts the rocks into soils? (5)
5. Explain the importance of Boussinesq's equation in determining ultimate settlement of clay layers due to construction of a building. (5)
6. what precautions and remedial measures would you undertake to control the "Seepage" through (i) earthen dam body (ii) through the dam foundation. (5)
7. What is permeability? State the variables on which the permeability of a Soil depends. (5)
8. Discuss, as to how and why the water rises and mercury depresses in a Capillary tube? (5)
9. How do project planning and project management related in development of any project implementation? (5)

Group: B (2×10=20)

10. Let's we have to construct a tunnel for hydropower project but there is fault in that tunnel alignment. That fault is observed through any alternate alignment we choose. A river is flowing on the ground surface of the tunnel alignment. The river

water is flowing through that fault to the tunnel which reduces the stability of the tunnel. Give your opinions on solving the problem. (10)

11. Explain the methods of research and process of data collection. Also illustrate the presentation and publication of qualitative journal and its framework. (10)

Group: C (10+5+5=20)

12. Analyse the Bachelor Level curriculum of Soil Mechanics of MTU in different angles and give your opinions to update it. (5+5)
13. Develop a lesson plan on a topic from the chapter of shear strength in soil mechanics for Bachelor level class. (5)
14. Write any five suitable methods for teaching the students of bachelor level in civil engineering field? And also mention the ways to introduce one of the methods in the class with illustration. (5)