

No. A.12024/9/2024-MPSC(DR-II)
MIZORAM PUBLIC SERVICE COMMISSION
Mizoram New Capital Complex, Aizawl

Dated Aizawl, the 19th February, 2025

Advertisement (Non-Gazetted Post) No. 10 of 2024 – 2025

The under mentioned vacant posts can be applied online on the Mizoram Public Service Commission's online portal <https://mpsconline.mizoram.gov.in> till **20/03/2025**.

1. Name of Examination : JE (Civil) under I&WR

Name of Post	No. of Posts	Name of Department	Pay Level in the Pay Matrix	Education and other qualifications required	Reservation Position
Junior Engineer	5 (Five)	Irrigation & Water Resources Department	Level 7	High school leaving certificate with 3 (Three) years Diploma in Agricultural Engineering/ Civil Engineering from Govt. recognized Institution	Nil

2. Common eligibility criteria:

i) Age Limit:

A candidate must not be less than 18 years and not more than 35 years of age on the last date of application. Further relaxation to the upper age limit will be as per Notification No.A-12011/1/2019-P&AR (GSW) dt.3.6.2019 (published in the Mizoram Gazette Extraordinary, Issue No. 375 dt.10.6.2019) as amended from time to time. For age proof documents, HSLC/HSSLC Certificates which clearly shows the candidate's date of birth shall be accepted. In the absence of date of birth in such certificates, the relevant documents issued by the competent authority may be accepted.

ii) Mizo Language Proficiency:

A candidate must achieve a minimum score in the qualifying test of Mizo Language Proficiency as prescribed by the Government from time to time. However, a candidate who studied Mizo subject in Class-X standard(HSLC) or above within Mizoram or who opted for Mizo subject as MIL outside Mizoram is exempted from taking the qualifying test paper(Reference: the Mizoram Gazette Notification vide No.A-11019/1/2021-P&AR(GSW) dt.09.04.2024 issue No.247).

Documentary support to prove all eligibility conditions should not be dated later than the last date of application.

3. Disqualification :

- (i) Canvassing by a candidate directly or indirectly will disqualify his/her candidature.
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6. Government servants will have to apply through proper channel.

7. Syllabus: Syllabus for the examination are available for download on the Commission's official website <https://tinyurl.com/JE-Syllabus-IWR> and placed alongside this Advertisement. Recruitment will be done through common competitive examination with similar questions in non-technical subjects i.e. Paper - I & II but separate questions in technical subjects i.e. Paper-III & IV for each post.

8. Any other information pertinent to this advertisement will be published on the Commission's official website.

In case of queries/clarification regarding their applications, candidature, etc. candidates may contact MPSC's Helpline No. 0389-3596493 on working days between 10:00am and 3:30pm.

Sd/-Dr. H.LIANZELA

Secretary

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Copy to:-

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2. PPS/PS to Members, Mizoram Public Service Commission, Aizawl.
3. PS to Secretary, Mizoram Public Service Commission, Aizawl.
4. The Secretary to the Govt. of Mizoram, I&WR Department with reference to the letters No. A.12011/1/2024-P&AR(GSW) dt.30.7.2024.
5. All Administrative Departments, Govt. of Mizoram.
6. All Heads of Departments, Govt. of Mizoram.
7. Deputy Commissioners, Aizawl / Lunglei / Siaha / Champhai / Kolasib / Serchhip / Lawngtlai / Mamit / Saitual / Khawzawl / Hnahthial with two spare copies each. One copy should be displayed in the Notice Board.
8. Resident Commissioner / Additional / Joint / Deputy / Asst. Resident Commissioners, Mizoram Houses – New Delhi / Kolkata / Mumbai / Guwahati / Shillong / Silchar / Bengaluru with two spare copies each for display in the Notice Board of Mizoram Houses.
9. District Employment Officer, Aizawl, Lunglei, Siaha, Champhai, Kolasib, Serchhip, Lawngtlai and Mamit with two spare copies each for display in the Notice Board.
10. All Officers, Mizoram Public Service Commission.
11. All Sections, Mizoram Public Service Commission.
12. Confidential Cell, Mizoram Public Service Commission, with 2 spare copies.
13. I.T. Cell, Mizoram Public Service Commission for uploading on the website.
14. Notice Board.
15. Guard File.

(VANLALTANPUIA)

Joint Controller of Examinations

**SYLLABUS FOR RECRUITMENT TO THE POSTS OF JUNIOR
ENGINEERING UNDER IRRIGATION & WATER RESOURCES
DEPARTMENT, GOVT OF MIZORAM**

The examination shall comprise of the following papers:

1) Paper – I : General English	:	100 Marks (3 hours)
2) Paper – II : General Knowledge (MCQ)	:	100 Marks (2 hours)
3) Paper – III : Technical Subject (MCQ)	:	200 Marks (2 hours)
4) Paper – IV : Technical Subject (MCQ)	:	200 Marks (2 hours)
Total of Written Examination :		600 Marks
5) Personal Interview	:	80 Marks
Total	:	680 Marks

DETAILED SYLLABUS:

1) PAPER – I : General English: 100 Marks (3 hours)

a) Précis Writing	:	10 marks
b) Letter Writing	:	15 marks
c) Comprehension of given passages	:	15 marks
d) Grammar: Parts of Speech	:	20 marks
e) Correct Usage and Vocabularies	:	20 marks
f) Formation of Sentence	:	20 marks

2) PAPER – II : General Knowledge (MCQ): 100 Marks (2 hours)

(a) Current events of state, national and international importance	:	12 marks
(b) History of India and Indian National Movement	:	12 marks
(c) Indian and World Geography - Physical, Social, Economic Geography of India and the World	:	12 marks
(d) Indian Polity and Governance - Constitution, Political System, Public Policy, Duties & Rights Issues	:	12 marks
(e) Economic and Social Development Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, and other related issues	:	12 marks
(f) General issues on Environmental Ecology, Bio-diversity and Climate	:	12 marks
(g) General Science	:	12 marks

The topics listed above shall cover the State of Mizoram wherever applicable.

(h) General awareness on Mizo culture, its heritage and society	:	16 marks
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Paper – III: Technical Subject (MCQ): 200 Marks (2 hours)

1. IRRIGATION:

70 marks

☐ Definition of Irrigation:

- Explanation of irrigation and its purpose.
- Role in agriculture and water management.

☐ Necessity of Irrigation:

- Importance of irrigation in agriculture.
- Benefits to crop yield and quality.
- Impact on food security and rural development.

☐ Types of Irrigation:

- Surface irrigation, sub-surface irrigation, sprinkler irrigation, drip irrigation.
- Advantages and disadvantages of each type.

☐ Sources of Irrigation Water:

- Rivers, lakes, wells, reservoirs, and rainwater harvesting.
- Importance of sustainable water resource management.

☐ Irrigation Canals:

- Definition and importance.
- Structure and components of irrigation canals.

☐ Perennial Irrigation:

- Definition and benefits.
- Comparison with other irrigation methods.

☐ Different Parts of Irrigation Canals and Their Functions:

- Main canal, branch canal, distributary, minor canal.
- Functions and importance of each part.

☐ Classification of Canals According to Their Alignment:

- Different types of canal alignments.
- Factors influencing canal alignment.

☐ Design of Irrigation Canals:

- Chezy's Formula: Use in canal design and calculation.
- Manning's Formula: Application in designing canals, calculation of flow parameters.
- Kennedy's Silt Theory and Equation: Importance in sediment management.
- Lacey's Silt Theory and Equation: Use in stable channel design.
- Critical Velocity Ratio: Definition and application in canal design.

☐ Various Types of Canal Lining:

- Different materials used for canal lining.
- Advantages: Reduced seepage, increased efficiency.
- Disadvantages: Cost, maintenance.

☐ Simple Numerical Problems:

- Solving problems related to canal design using the above formulas.

2. AGRICULTURE FIELD DRAINAGE:

30 marks

☐ Definition of Drainage:

- Explanation of agricultural field drainage.
- Importance in maintaining soil health and crop productivity.

☐ Water Logging:

- Definition and understanding of water logging.
- Types and causes of water logging in agricultural fields.

☐ Causes and Effects of Water Logging:

- Natural and anthropogenic causes.
- Effects on soil health, crop yield, and overall agricultural productivity.

☐ Detection of Water Logging:

- Methods to identify and assess water-logged areas.
- Use of modern techniques (e.g., remote sensing, soil moisture sensors).

☐ Prevention and Remedies:

- Techniques to prevent water logging (e.g., proper irrigation practices, soil management).
- Remedial measures (e.g., drainage systems, crop rotation, soil amendment).

☐ Surface Drains:

- Definition and types of surface drainage systems.
- Design and layout of surface drains.
- Benefits and limitations.

☐ Sub-surface Drains:

- Definition and types of sub-surface drainage systems.
- Design and layout of sub-surface drains.
- Benefits and limitations.

☐ Layout of Drains:

- Planning and designing effective drainage systems.
- Factors affecting the layout of drainage systems.
- Maintenance of drainage systems.

3 SURVEYING AND LEVELLING (Theory):

30 marks

☐ Concept:

- Definition and purpose of surveying and levelling.
- Importance in civil engineering and infrastructure development.

☐ Terms:

- Key terms and definitions used in surveying and levelling (e.g., benchmark, datum, back sight, fore sight, etc.).

☐ Classifications:

- Different types of surveying (e.g., plane surveying, geodetic surveying).
- Types of levelling (e.g., simple levelling, differential levelling, profile levelling).

☐ Aims of Surveying and Levelling:

- Objectives and goals of conducting surveys and levelling.
- Applications in planning, design, and construction.

☐ Plane Table Surveying:

- Equipment and methods used in plane table surveying.
- Procedures for conducting plane table surveys.
- Advantages and limitations.

☐ Contouring:

- Definition and importance of contours in surveying.
- Methods of contouring (e.g., direct method, indirect method).
- Uses of contour maps in engineering projects.

☐ Principles of Theodolite Surveying & Traversing:

- Components and functions of a theodolite.
- Procedures for theodolite surveying.
- Traversing techniques and their applications.
- Adjustments and error corrections in traversing.

☐ Modern Surveying Methods:

- Introduction to modern surveying techniques (e.g., total station, GPS, GIS).
- Applications and advantages of modern methods.
- Comparison with traditional surveying methods.

4. HYDROLOGY:

30 marks

☐ Definition of Hydrology:

- Study of the movement, distribution, and quality of water on Earth.
- Importance in water resource management and planning.

☐ Rainfall:

- Types of rainfall (convective, orographic, frontal).
- Measurement and analysis of rainfall data.

☐ Effective Rainfall and Run-off:

- Definition and factors affecting effective rainfall.
- Calculation and significance of run-off in hydrology.

☐ Catchment Area:

- Definition and importance.
- Methods of delineating catchment areas.
- Impact on water resource planning and management.

☐ Relationship (between Rainfall, Run-off, and Catchment Area):

- Understanding the hydrological balance.
- Factors influencing the relationship.

☐ Dicken's and Ryve's Formulae:

- Applications in estimating peak discharge.
- Understanding and using formulas in hydrological calculations.

☐ Stream Gauging:

- Techniques and importance of stream gauging.
- Methods to measure streamflow and discharge.

☐ Types of Rain Gauges:

- Different types (non-recording, recording, tipping bucket, weighing type, etc.).
- Uses and maintenance of rain gauges.

☐ Importance of Hydrology:

- Role in flood control, irrigation planning, water supply management.
- Environmental and societal impacts.

☐ Hydrological Cycle:

- Components and processes (evaporation, condensation, precipitation, infiltration, etc.).
- Importance in maintaining water balance on Earth.

☐ Concept of Hydrograph:

- Definition and components of a hydrograph.
- Uses in analyzing streamflow and designing hydraulic structures.

☐ Groundwater Hydrology:

- Basics of groundwater occurrence and movement.
- Importance of groundwater in overall water resource management.
- Methods to assess and manage groundwater resources.

5. WATER REQUIREMENT OF CROPS:

40 marks

☐ Concept of Crop Water Requirement:

- Understanding the total water needed for a crop during its growing season.
- Factors affecting crop water requirement (climate, crop type, soil type, etc.).

☐ Field Irrigation Requirement:

- Definition and importance.
- Methods to determine field irrigation requirement.
- Efficiency of different irrigation methods (surface, sprinkler, drip irrigation).

☐ Crop Season:

- Definition and importance.
- Different crop seasons (Kharif, Rabi, Zaid) and their water requirements.

☐ Duty, Delta, and Base Period:

- Duty: The area of land that can be irrigated with a unit volume of water.
- Delta: The depth of water required to mature the crop.
- Base Period: The time period from the first watering to the last watering for a crop.
- Relationship among Duty, Delta, and Base Period.

☐ Gross Command Area (GCA):

- Definition and importance.
- Calculation and management of GCA.

☐ Culturable Command Area (CCA):

- Definition and differentiation from GCA.
- Calculation and utilization in irrigation planning.

☐ Intensity of Irrigation:

- Concept and importance.
- Calculation and factors affecting the intensity of irrigation.

☐ Simple Numerical Problems:

- Solving problems related to Duty, Delta, Base Period, GCA, CCA, and Intensity of Irrigation.

Paper – IV: Technical Subject (MCQ): 200 Marks (2 hours)

1. HYDRAULICS STRUCTURES:

60 marks

- ☐ Definition, Necessity & Objective:
 - Explanation of hydraulic structures.
 - Importance and objectives in water resource management.
- ☐ General Layout:
 - Components and design considerations of hydraulic structures.
 - Layout planning for efficient water flow and management.
- ☐ Functions of Different Parts of a Barrage:
 - Detailed functions of piers, gates, sluices, energy dissipaters, etc.
 - Operational significance of each part.
- ☐ Difference Between Weir and Barrage:
 - Structural and functional differences.
 - Advantages and limitations of each.
- ☐ Definition of Regulatory Work & Types of Their Functions:
 - Explanation of regulatory works
 - Types and purposes of regulatory structures.
- ☐ Cross and Head Regulators:
 - Functions and importance in irrigation systems.
 - Design and operational aspects.
- ☐ Falls:
 - Purpose and types of falls in irrigation canals.
 - Design principles and energy dissipation methods.
- ☐ Energy Dissipaters:
 - Necessity for energy dissipation in hydraulic structures.
 - Types and design of energy dissipaters.
- ☐ Outlets – Different Types:
 - Various types of water outlets (e.g., orifice, sluice, pipe outlets).
 - Applications and design considerations.
- ☐ Escapes:
 - Definition and necessity.
 - Types and functions of escape structures in irrigation systems.
- ☐ Definition, Functions, and Necessity of Aqueduct, Siphon, Super-passage, Level Crossing, Inlet and Outlet:
 - Detailed explanation of each structure.
 - Importance and design considerations.
- ☐ Constructional Details:
 - Materials and methods used in constructing hydraulic structures.
 - Durability and maintenance aspects.

Dam Classification:

- Types of dams: Earthen, masonry, concrete.
- Importance and applications of each type.

□ Earthen Dams:

- Types, necessity, and advantages.
- Causes of failure and protection measures.

□ Masonry and Concrete Dams:

- Structural features and construction techniques.
- Forces acting on the dam and stress analysis at the base.

□ Spillways:

- Types and functions of spillways.
- Design considerations for effective flood control.

□ River Training Works:

- Purpose and methods of river training.
- Techniques to control and manage river flow.

2. CONCRETE TECHNOLOGY:

40 marks

□ Concrete as Construction Material:

- Introduction to concrete and its importance in construction.
- Composition and properties.

□ Cement:

- Types of cement and their properties.
- Manufacturing process.
- Tests for quality assurance.

□ Aggregates:

- Types of aggregates (fine and coarse).
- Properties and grading.
- Importance in concrete mix.

□ Water:

- Role of water in concrete.
- Quality requirements for mixing and curing.
- Water-cement ratio.

□ Admixtures:

- Types and functions of admixtures.
- Impact on concrete properties and performance.

□ Properties of Hardened Concrete:

- Strength (compressive, tensile, flexural).
- Durability and permeability.
- Shrinkage and creep.
- Thermal properties.

☞ Proportioning of Concrete Mixes:

- Principles of mix design.
- Methods of mix proportioning (nominal mix, design mix).
- Factors affecting mix design.

☐ Production of Concrete:

- Batching, mixing, and transporting.
- Placing, compacting, and curing.
- Equipment and methods used.

☐ Special Concrete:

- Types of special concrete (e.g., high-strength, lightweight, self-compacting, fiber-reinforced).
- Applications and properties.

☐ Quality and Control of Concrete:

- Standards and specifications.
- Quality control tests (slump test, compressive strength test, etc.).
- Factors affecting quality and methods to ensure it.

☐ Repair & Rehabilitation Technology for Concrete Structures:

- Common defects and deterioration in concrete structures.
- Techniques for repair and strengthening.
- Materials and methods used in rehabilitation.

MECHANICS OF MATERIALS:

30 marks

☐ Stress-Strain Diagram:

- Understanding of stress-strain curves for different materials.
- Elastic and plastic behavior, yield point, ultimate strength, and fracture.

☐ Stress Strain Relations:

- Hooke's Law and modulus of elasticity.
- Poisson's ratio and volumetric strain.
- Relationship between stress and strain for different loading conditions.

☐ Complex Stresses and Strain:

- Analysis of biaxial and triaxial stress states.
- Principal stresses and strains.
- Mohr's circle for stress and strain analysis.

☐ Analysis of Beams:

- Types of beams and loading conditions.
- Shear force and bending moment diagrams.
- Calculation of bending stresses and shear stresses in beams.

☐ Torsion:

- Torsional stress and strain in circular shafts.
- Angle of twist and power transmission.
- Torsion of non-circular shafts and thin-walled tubes.

☐ Columns & Struts:

- Buckling of columns under axial load.
- Euler's formula for long columns.
- Rankine's formula for short columns and intermediate length columns.

☐ Slope and Deflection of Beams:

- Calculation of slope and deflection using various methods (double integration method, Macaulay's method, moment area method).
- Importance in the design and analysis of structural elements.

ESTIMATING & COSTING:

40 marks

- ☐ Concept of Estimating:
 - Definition and purpose of estimating.
 - Types of estimates (preliminary, detailed, revised, supplementary).
- ☐ Method of Measurement:
 - Standard methods of measurement for various construction works.
 - Units of measurement for different materials and activities.
- ☐ Calculating Quantities:
 - Techniques for calculating quantities of materials and labor.
 - Preparation of quantity take-offs and bill of quantities.
- ☐ Estimating of Earth Work:
 - Methods for estimating earthwork volumes (cutting, filling).
 - Use of cross-sections and contour plans in earthwork estimation.
- ☐ Road Work:
 - Estimation of quantities for road construction (pavement, sub-base, base course).
 - Calculation of materials for different layers and components.
- ☐ Concrete Works:
 - Estimation of quantities for concrete mix, formwork, and reinforcement.
 - Calculation of concrete volumes for foundations, beams, slabs, columns.
- ☐ Flooring and Finishing:
 - Estimation of materials and labor for flooring works (tiles, marble, terrazzo).
 - Calculation for plastering, painting, and other finishing works.
- ☐ Steel & Timber Work:
 - Estimation of steel reinforcement for RCC works.
 - Calculation of quantities for timber structures (trusses, frames).
- ☐ Estimating, Abstracting, and Billing of Complete Items of Works:
 - Preparation of detailed estimates for complete projects.
 - Abstracting quantities and preparing bills of quantities.
 - Billing procedures and documentation.
- ☐ Cost Analysis:
 - Analysis of rates for various construction activities.
 - Factors affecting cost and methods for cost control.
- ☐ General and Detailed Specification:
 - Understanding specifications for materials and workmanship.
 - Writing detailed specifications for different items of work.

5. GEO-TECHNICAL ENGINEERING:

30 marks

☐ Classification of Soils:

- Different soil classification systems (e.g., Unified Soil Classification System, AASHTO).
- Soil types and their properties.

☐ Soil Structures:

- Understanding of soil structure (e.g., granular, cohesive).
- Formation and characteristics of different soil structures.

☐ Soil Mass & Fundamental Concepts and Principles:

- Soil as a three-phase system.
- Concepts of void ratio, porosity, degree of saturation, and unit weight.

☐ Index Properties:

- Determination of index properties such as specific gravity, moisture content, Atterberg limits.
- Importance in soil classification and behavior prediction.

☐ Permeability:

- Darcy's Law and coefficient of permeability.
- Laboratory and field methods for determining permeability.

☐ Seepage Analysis:

- Principles of seepage and flow nets.
- Application of seepage analysis in engineering problems.

☐ Compaction:

- Importance of soil compaction in engineering.
- Standard and modified Proctor tests.
- Factors affecting compaction and field compaction methods.

☐ Consolidation:

- Concept of consolidation and consolidation settlement.
- Terzaghi's one-dimensional consolidation theory.
- Laboratory methods for determining consolidation parameters.

☐ CBR Method:

- California Bearing Ratio (CBR) test procedure and significance.
- Use of CBR values in pavement design.

☐ Shear Strength:

- Mohr-Coulomb failure criterion.
- Laboratory and field methods for determining shear strength.
- Importance in slope stability and foundation design.

☐ Stability of Slopes:

- Types of slope failures and factors affecting stability.
- Methods of slope stability analysis.
- Techniques for improving slope stability.

□ Soil Exploration & Site Investigation:

- Objectives and methods of soil exploration.
- Types of site investigation (preliminary, detailed).
- Techniques for sampling and in-situ testing.

□ Foundation Engineering:

- Types of foundations (shallow and deep).
- Bearing capacity and settlement analysis.
- Design principles for different types of foundations.

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Sd/-Dr. H.LIANZELA

Secretary

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3. PS to Secretary, Mizoram Public Service Commission, Aizawl.
4. The Secretary to the Govt. of Mizoram, I&WR Department with reference to the letters No. A.12011/1/2024-P&AR(GSW) dt.30.7.2024.
5. All Administrative Departments, Govt. of Mizoram.
6. All Heads of Departments, Govt. of Mizoram.
7. Deputy Commissioners, Aizawl / Lunglei / Siaha / Champhai / Kolasib / Serchhip / Lawngtlai / Mamit / Saitual / Khawzawl / Hnahthial with two spare copies each. One copy should be displayed in the Notice Board.
8. Resident Commissioner / Additional / Joint / Deputy / Asst. Resident Commissioners, Mizoram Houses – New Delhi / Kolkata / Mumbai / Guwahati / Shillong / Silchar / Bengaluru with two spare copies each for display in the Notice Board of Mizoram Houses.
9. District Employment Officer, Aizawl, Lunglei, Siaha, Champhai, Kolasib, Serchhip, Lawngtlai and Mamit with two spare copies each for display in the Notice Board.
10. All Officers, Mizoram Public Service Commission.
11. All Sections, Mizoram Public Service Commission.
12. Confidential Cell, Mizoram Public Service Commission, with 2 spare copies.
13. I.T. Cell, Mizoram Public Service Commission for uploading on the website.
14. Notice Board.
15. Guard File.



(VANLALTANPUIA)

Joint Controller of Examinations

**SYLLABUS FOR RECRUITMENT TO THE POSTS OF JUNIOR
ENGINEERING UNDER IRRIGATION & WATER RESOURCES
DEPARTMENT, GOVT OF MIZORAM**

The examination shall comprise of the following papers:

1) Paper – I : General English	:	100 Marks (3 hours)
2) Paper – II : General Knowledge (MCQ)	:	100 Marks (2 hours)
3) Paper – III : Technical Subject (MCQ)	:	200 Marks (2 hours)
4) Paper – IV : Technical Subject (MCQ)	:	200 Marks (2 hours)
Total of Written Examination :		600 Marks
5) Personal Interview	:	80 Marks
Total	:	680 Marks

DETAILED SYLLABUS:

1) PAPER – I : General English: 100 Marks (3 hours)

a) Précis Writing	:	10 marks
b) Letter Writing	:	15 marks
c) Comprehension of given passages	:	15 marks
d) Grammar: Parts of Speech	:	20 marks
e) Correct Usage and Vocabularies	:	20 marks
f) Formation of Sentence	:	20 marks

2) PAPER – II : General Knowledge (MCQ): 100 Marks (2 hours)

(a) Current events of state, national and international importance	:	12 marks
(b) History of India and Indian National Movement	:	12 marks
(c) Indian and World Geography - Physical, Social, Economic Geography of India and the World	:	12 marks
(d) Indian Polity and Governance - Constitution, Political System, Public Policy, Duties & Rights Issues	:	12 marks
(e) Economic and Social Development Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, and other related issues	:	12 marks
(f) General issues on Environmental Ecology, Bio-diversity and Climate	:	12 marks
(g) General Science	:	12 marks

The topics listed above shall cover the State of Mizoram wherever applicable.

(h) General awareness on Mizo culture, its heritage and society	:	16 marks
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Paper – III: Technical Subject (MCQ): 200 Marks (2 hours)

1. IRRIGATION:

70 marks

- ☐ Definition of Irrigation:
 - Explanation of irrigation and its purpose.
 - Role in agriculture and water management.
- ☐ Necessity of Irrigation:
 - Importance of irrigation in agriculture.
 - Benefits to crop yield and quality.
 - Impact on food security and rural development.
- ☐ Types of Irrigation:
 - Surface irrigation, sub-surface irrigation, sprinkler irrigation, drip irrigation.
 - Advantages and disadvantages of each type.
- ☐ Sources of Irrigation Water:
 - Rivers, lakes, wells, reservoirs, and rainwater harvesting.
 - Importance of sustainable water resource management.
- ☐ Irrigation Canals:
 - Definition and importance.
 - Structure and components of irrigation canals.
- ☐ Perennial Irrigation:
 - Definition and benefits.
 - Comparison with other irrigation methods.
- ☐ Different Parts of Irrigation Canals and Their Functions:
 - Main canal, branch canal, distributary, minor canal.
 - Functions and importance of each part.
- ☐ Classification of Canals According to Their Alignment:
 - Different types of canal alignments.
 - Factors influencing canal alignment.
- ☐ Design of Irrigation Canals:
 - Chezy's Formula: Use in canal design and calculation.
 - Manning's Formula: Application in designing canals, calculation of flow parameters.
 - Kennedy's Silt Theory and Equation: Importance in sediment management.
 - Lacey's Silt Theory and Equation: Use in stable channel design.
 - Critical Velocity Ratio: Definition and application in canal design.
- ☐ Various Types of Canal Lining:
 - Different materials used for canal lining.
 - Advantages: Reduced seepage, increased efficiency.
 - Disadvantages: Cost, maintenance.
- ☐ Simple Numerical Problems:
 - Solving problems related to canal design using the above formulas.

2. AGRICULTURE FIELD DRAINAGE:

30 marks

☐ Definition of Drainage:

- Explanation of agricultural field drainage.
- Importance in maintaining soil health and crop productivity.

☐ Water Logging:

- Definition and understanding of water logging.
- Types and causes of water logging in agricultural fields.

☐ Causes and Effects of Water Logging:

- Natural and anthropogenic causes.
- Effects on soil health, crop yield, and overall agricultural productivity.

☐ Detection of Water Logging:

- Methods to identify and assess water-logged areas.
- Use of modern techniques (e.g., remote sensing, soil moisture sensors).

☐ Prevention and Remedies:

- Techniques to prevent water logging (e.g., proper irrigation practices, soil management).
- Remedial measures (e.g., drainage systems, crop rotation, soil amendment).

☐ Surface Drains:

- Definition and types of surface drainage systems.
- Design and layout of surface drains.
- Benefits and limitations.

☐ Sub-surface Drains:

- Definition and types of sub-surface drainage systems.
- Design and layout of sub-surface drains.
- Benefits and limitations.

☐ Layout of Drains:

- Planning and designing effective drainage systems.
- Factors affecting the layout of drainage systems.
- Maintenance of drainage systems.

3 SURVEYING AND LEVELLING (Theory):

30 marks

☐ Concept:

- Definition and purpose of surveying and levelling.
- Importance in civil engineering and infrastructure development.

☐ Terms:

- Key terms and definitions used in surveying and levelling (e.g., benchmark, datum, back sight, fore sight, etc.).

☐ Classifications:

- Different types of surveying (e.g., plane surveying, geodetic surveying).
- Types of levelling (e.g., simple levelling, differential levelling, profile levelling).

☐ Aims of Surveying and Levelling:

- Objectives and goals of conducting surveys and levelling.
- Applications in planning, design, and construction.

☐ Plane Table Surveying:

- Equipment and methods used in plane table surveying.
- Procedures for conducting plane table surveys.
- Advantages and limitations.

☐ Contouring:

- Definition and importance of contours in surveying.
- Methods of contouring (e.g., direct method, indirect method).
- Uses of contour maps in engineering projects.

☐ Principles of Theodolite Surveying & Traversing:

- Components and functions of a theodolite.
- Procedures for theodolite surveying.
- Traversing techniques and their applications.
- Adjustments and error corrections in traversing.

☐ Modern Surveying Methods:

- Introduction to modern surveying techniques (e.g., total station, GPS, GIS).
- Applications and advantages of modern methods.
- Comparison with traditional surveying methods.

4. HYDROLOGY:

30 marks

- ☐ Definition of Hydrology:
 - Study of the movement, distribution, and quality of water on Earth.
 - Importance in water resource management and planning.
- ☐ Rainfall:
 - Types of rainfall (convective, orographic, frontal).
 - Measurement and analysis of rainfall data.
- ☐ Effective Rainfall and Run-off:
 - Definition and factors affecting effective rainfall.
 - Calculation and significance of run-off in hydrology.
- ☐ Catchment Area:
 - Definition and importance.
 - Methods of delineating catchment areas.
 - Impact on water resource planning and management.
- ☐ Relationship (between Rainfall, Run-off, and Catchment Area):
 - Understanding the hydrological balance.
 - Factors influencing the relationship.
- ☐ Dicken's and Ryve's Formulae:
 - Applications in estimating peak discharge.
 - Understanding and using formulas in hydrological calculations.
- ☐ Stream Gauging:
 - Techniques and importance of stream gauging.
 - Methods to measure streamflow and discharge.
- ☐ Types of Rain Gauges:
 - Different types (non-recording, recording, tipping bucket, weighing type, etc.).
 - Uses and maintenance of rain gauges.
- ☐ Importance of Hydrology:
 - Role in flood control, irrigation planning, water supply management.
 - Environmental and societal impacts.
- ☐ Hydrological Cycle:
 - Components and processes (evaporation, condensation, precipitation, infiltration, etc.).
 - Importance in maintaining water balance on Earth.
- ☐ Concept of Hydrograph:
 - Definition and components of a hydrograph.
 - Uses in analyzing streamflow and designing hydraulic structures.
- ☐ Groundwater Hydrology:
 - Basics of groundwater occurrence and movement.
 - Importance of groundwater in overall water resource management.
 - Methods to assess and manage groundwater resources.

5. WATER REQUIREMENT OF CROPS:

40 marks

☐ Concept of Crop Water Requirement:

- Understanding the total water needed for a crop during its growing season.
- Factors affecting crop water requirement (climate, crop type, soil type, etc.).

☐ Field Irrigation Requirement:

- Definition and importance.
- Methods to determine field irrigation requirement.
- Efficiency of different irrigation methods (surface, sprinkler, drip irrigation).

☐ Crop Season:

- Definition and importance.
- Different crop seasons (Kharif, Rabi, Zaid) and their water requirements.

☐ Duty, Delta, and Base Period:

- Duty: The area of land that can be irrigated with a unit volume of water.
- Delta: The depth of water required to mature the crop.
- Base Period: The time period from the first watering to the last watering for a crop.
- Relationship among Duty, Delta, and Base Period.

☐ Gross Command Area (GCA):

- Definition and importance.
- Calculation and management of GCA.

☐ Culturable Command Area (CCA):

- Definition and differentiation from GCA.
- Calculation and utilization in irrigation planning.

☐ Intensity of Irrigation:

- Concept and importance.
- Calculation and factors affecting the intensity of irrigation.

☐ Simple Numerical Problems:

- Solving problems related to Duty, Delta, Base Period, GCA, CCA, and Intensity of Irrigation.

Paper – IV: Technical Subject (MCQ): 200 Marks (2 hours)

1. HYDRAULICS STRUCTURES:

60 marks

- ☐ Definition, Necessity & Objective:
 - Explanation of hydraulic structures.
 - Importance and objectives in water resource management.
- ☐ General Layout:
 - Components and design considerations of hydraulic structures.
 - Layout planning for efficient water flow and management.
- ☐ Functions of Different Parts of a Barrage:
 - Detailed functions of piers, gates, sluices, energy dissipaters, etc.
 - Operational significance of each part.
- ☐ Difference Between Weir and Barrage:
 - Structural and functional differences.
 - Advantages and limitations of each.
- ☐ Definition of Regulatory Work & Types of Their Functions:
 - Explanation of regulatory works
 - Types and purposes of regulatory structures.
- ☐ Cross and Head Regulators:
 - Functions and importance in irrigation systems.
 - Design and operational aspects.
- ☐ Falls:
 - Purpose and types of falls in irrigation canals.
 - Design principles and energy dissipation methods.
- ☐ Energy Dissipaters:
 - Necessity for energy dissipation in hydraulic structures.
 - Types and design of energy dissipaters.
- ☐ Outlets – Different Types:
 - Various types of water outlets (e.g., orifice, sluice, pipe outlets).
 - Applications and design considerations.
- ☐ Escapes:
 - Definition and necessity.
 - Types and functions of escape structures in irrigation systems.
- ☐ Definition, Functions, and Necessity of Aqueduct, Siphon, Super-passage, Level Crossing, Inlet and Outlet:
 - Detailed explanation of each structure.
 - Importance and design considerations.
- ☐ Constructional Details:
 - Materials and methods used in constructing hydraulic structures.
 - Durability and maintenance aspects.

Dam Classification:

- Types of dams: Earthen, masonry, concrete.
- Importance and applications of each type.

□ Earthen Dams:

- Types, necessity, and advantages.
- Causes of failure and protection measures.

□ Masonry and Concrete Dams:

- Structural features and construction techniques.
- Forces acting on the dam and stress analysis at the base.

□ Spillways:

- Types and functions of spillways.
- Design considerations for effective flood control.

□ River Training Works:

- Purpose and methods of river training.
- Techniques to control and manage river flow.

2. CONCRETE TECHNOLOGY:

40 marks

□ Concrete as Construction Material:

- Introduction to concrete and its importance in construction.
- Composition and properties.

□ Cement:

- Types of cement and their properties.
- Manufacturing process.
- Tests for quality assurance.

□ Aggregates:

- Types of aggregates (fine and coarse).
- Properties and grading.
- Importance in concrete mix.

□ Water:

- Role of water in concrete.
- Quality requirements for mixing and curing.
- Water-cement ratio.

□ Admixtures:

- Types and functions of admixtures.
- Impact on concrete properties and performance.

□ Properties of Hardened Concrete:

- Strength (compressive, tensile, flexural).
- Durability and permeability.
- Shrinkage and creep.
- Thermal properties.

☞ Proportioning of Concrete Mixes:

- Principles of mix design.
- Methods of mix proportioning (nominal mix, design mix).
- Factors affecting mix design.

☐ Production of Concrete:

- Batching, mixing, and transporting.
- Placing, compacting, and curing.
- Equipment and methods used.

☐ Special Concrete:

- Types of special concrete (e.g., high-strength, lightweight, self-compacting, fiber-reinforced).
- Applications and properties.

☐ Quality and Control of Concrete:

- Standards and specifications.
- Quality control tests (slump test, compressive strength test, etc.).
- Factors affecting quality and methods to ensure it.

☐ Repair & Rehabilitation Technology for Concrete Structures:

- Common defects and deterioration in concrete structures.
- Techniques for repair and strengthening.
- Materials and methods used in rehabilitation.

MECHANICS OF MATERIALS:

30 marks

☐ Stress-Strain Diagram:

- Understanding of stress-strain curves for different materials.
- Elastic and plastic behavior, yield point, ultimate strength, and fracture.

☐ Stress Strain Relations:

- Hooke's Law and modulus of elasticity.
- Poisson's ratio and volumetric strain.
- Relationship between stress and strain for different loading conditions.

☐ Complex Stresses and Strain:

- Analysis of biaxial and triaxial stress states.
- Principal stresses and strains.
- Mohr's circle for stress and strain analysis.

☐ Analysis of Beams:

- Types of beams and loading conditions.
- Shear force and bending moment diagrams.
- Calculation of bending stresses and shear stresses in beams.

☐ Torsion:

- Torsional stress and strain in circular shafts.
- Angle of twist and power transmission.
- Torsion of non-circular shafts and thin-walled tubes.

☐ Columns & Struts:

- Buckling of columns under axial load.
- Euler's formula for long columns.
- Rankine's formula for short columns and intermediate length columns.

☐ Slope and Deflection of Beams:

- Calculation of slope and deflection using various methods (double integration method, Macaulay's method, moment area method).
- Importance in the design and analysis of structural elements.

ESTIMATING & COSTING:

40 marks

- ☐ Concept of Estimating:
 - Definition and purpose of estimating.
 - Types of estimates (preliminary, detailed, revised, supplementary).
- ☐ Method of Measurement:
 - Standard methods of measurement for various construction works.
 - Units of measurement for different materials and activities.
- ☐ Calculating Quantities:
 - Techniques for calculating quantities of materials and labor.
 - Preparation of quantity take-offs and bill of quantities.
- ☐ Estimating of Earth Work:
 - Methods for estimating earthwork volumes (cutting, filling).
 - Use of cross-sections and contour plans in earthwork estimation.
- ☐ Road Work:
 - Estimation of quantities for road construction (pavement, sub-base, base course).
 - Calculation of materials for different layers and components.
- ☐ Concrete Works:
 - Estimation of quantities for concrete mix, formwork, and reinforcement.
 - Calculation of concrete volumes for foundations, beams, slabs, columns.
- ☐ Flooring and Finishing:
 - Estimation of materials and labor for flooring works (tiles, marble, terrazzo).
 - Calculation for plastering, painting, and other finishing works.
- ☐ Steel & Timber Work:
 - Estimation of steel reinforcement for RCC works.
 - Calculation of quantities for timber structures (trusses, frames).
- ☐ Estimating, Abstracting, and Billing of Complete Items of Works:
 - Preparation of detailed estimates for complete projects.
 - Abstracting quantities and preparing bills of quantities.
 - Billing procedures and documentation.
- ☐ Cost Analysis:
 - Analysis of rates for various construction activities.
 - Factors affecting cost and methods for cost control.
- ☐ General and Detailed Specification:
 - Understanding specifications for materials and workmanship.
 - Writing detailed specifications for different items of work.

5. GEO-TECHNICAL ENGINEERING:

30 marks

- ☐ Classification of Soils:
 - Different soil classification systems (e.g., Unified Soil Classification System, AASHTO).
 - Soil types and their properties.
- ☐ Soil Structures:
 - Understanding of soil structure (e.g., granular, cohesive).
 - Formation and characteristics of different soil structures.
- ☐ Soil Mass & Fundamental Concepts and Principles:
 - Soil as a three-phase system.
 - Concepts of void ratio, porosity, degree of saturation, and unit weight.
- ☐ Index Properties:
 - Determination of index properties such as specific gravity, moisture content, Atterberg limits.
 - Importance in soil classification and behavior prediction.
- ☐ Permeability:
 - Darcy's Law and coefficient of permeability.
 - Laboratory and field methods for determining permeability.
- ☐ Seepage Analysis:
 - Principles of seepage and flow nets.
 - Application of seepage analysis in engineering problems.
- ☐ Compaction:
 - Importance of soil compaction in engineering.
 - Standard and modified Proctor tests.
 - Factors affecting compaction and field compaction methods.
- ☐ Consolidation:
 - Concept of consolidation and consolidation settlement.
 - Terzaghi's one-dimensional consolidation theory.
 - Laboratory methods for determining consolidation parameters.
- ☐ CBR Method:
 - California Bearing Ratio (CBR) test procedure and significance.
 - Use of CBR values in pavement design.
- ☐ Shear Strength:
 - Mohr-Coulomb failure criterion.
 - Laboratory and field methods for determining shear strength.
 - Importance in slope stability and foundation design.
- ☐ Stability of Slopes:
 - Types of slope failures and factors affecting stability.
 - Methods of slope stability analysis.
 - Techniques for improving slope stability.

□ Soil Exploration & Site Investigation:

- Objectives and methods of soil exploration.
- Types of site investigation (preliminary, detailed).
- Techniques for sampling and in-situ testing.

□ Foundation Engineering:

- Types of foundations (shallow and deep).
- Bearing capacity and settlement analysis.
- Design principles for different types of foundations.