

**GOVERNMENT OF MIZORAM
PUBLIC WORKS DEPARTMENT**

**COMPETITIVE EXAMINATION FOR RECRUITMENT TO
THE POST OF SECTION ASSISTANT (PE)
(SEPTEMBER -2026)**

PAPER-II

**(BUILDING MATERIALS, SOIL MECHANICS AND
FOUNDATION ENGINEER, HYDROLOGY AND RAIN
WATER HARVESTING & PROTECTIVE WORKS,
SLOPE STABILITY AND LAND)**

Full Marks : 200
Time Allowed : 3 Hours

Signature of Invigilator _____

CODE :

(For official use)

SUBJECT	MARK CARRIED BY EACH QUESTION / TOPIC	NO. OF CORRECT ANSWERS	MARKS OBTAINED
Paper-II	2		
TOTAL			

Signature of Examiner : _____

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All questions carry 2 marks.

Put a tick (✓) mark against the correct answer in the space given in each question.

If a candidate gives more than one answer to one question, it will be treated as wrong answer even if one of the given answers happens to be correct.

BUILDING MATERIALS - 50 MARKS

1. The ability of a building stone to resist weathering action is called:

- (a) Workability ()
- (b) **Durability** ()
- (c) Elasticity ()
- (d) Plasticity ()

2. The crushing strength test on a building stone determines its:

- (a) Tensile strength ()
- (b) **Compressive strength** ()
- (c) Impact strength ()
- (d) Shear strength ()

3. A good, well-burnt clay brick generally has a:

- (a) Pale-yellow colour ()
- (b) **Uniform deep-red or copper colour** ()
- (c) Black surface throughout ()
- (d) White and powdery surface ()

4. Efflorescence on bricks is caused by the presence of:

- (a) Organic impurities ()
- (b) **Soluble salts** ()
- (c) Excess clay ()
- (d) Coarse sand particles ()

5. Which of the following is primarily a silicate-based material?

- (a) **Glass** ()
- (b) Bitumen ()
- (c) Steel ()
- (d) Aluminium ()

6. The standard consistency of cement is determined using the:

- (a) Slump cone apparatus ()
- (b) **Vicat apparatus** ()
- (c) Le Chatelier apparatus ()
- (d) Los Angeles apparatus ()

7. The soundness of cement is commonly tested using the:
- (a) Pycnometer ()
 - (b) Compaction factor apparatus ()
 - (c) **Le Chatelier apparatus** ()
 - (d) Flow table ()
8. The principal function of mortar in masonry is to:
- (a) Increase the weight of masonry ()
 - (b) **Bind masonry units together** ()
 - (c) Reduce the size of bricks ()
 - (d) Replace reinforcement ()
9. Bulking of sand occurs mainly because of:
- (a) Cement coating ()
 - (b) **Moisture films around sand particles** ()
 - (c) Excessive compaction ()
 - (d) High specific gravity ()
10. Sieve analysis of aggregates is carried out to determine their:
- (a) Crushing strength ()
 - (b) **Particle-size distribution** ()
 - (c) Water absorption ()
 - (d) Specific gravity ()
11. The flakiness index is used to assess the:
- (a) Strength of cement ()
 - (b) **Shape of aggregate particles** ()
 - (c) Moisture content of timber ()
 - (d) Colour of bricks ()
12. Asbestos products were traditionally used in buildings mainly because of their:
- (a) High electrical conductivity ()
 - (b) **Fire and heat resistance** ()
 - (c) High water solubility ()
 - (d) High biodegradability ()
13. The process of reducing the moisture content of timber is known as:
- (a) **Seasoning** ()
 - (b) Annealing ()
 - (c) Tempering ()
 - (d) Galvanising ()
14. Plywood is manufactured by:
- (a) Casting molten wood ()
 - (b) **Bonding thin veneers with adjacent grains approximately perpendicular** ()
 - (c) Compressing sawdust without adhesive ()
 - (d) Joining thick timber sections using bolts only ()

15. The ingredient in paint that primarily provides colour and opacity is the:
- (a) Solvent ()
 - (b) Pigment** ()
 - (c) Drier ()
 - (d) Plasticiser ()
16. Varnish is generally used to provide a:
- (a) Transparent protective finish** ()
 - (b) Thick cementitious coating ()
 - (c) Metallic reinforcement layer ()
 - (d) Completely opaque plaster finish ()
17. The principal constituent of ferrous metals is:
- (a) Copper ()
 - (b) Aluminium ()
 - (c) Iron** ()
 - (d) Zinc ()
18. Galvanising protects steel by coating it with:
- (a) Lead ()
 - (b) Zinc** ()
 - (c) Tin ()
 - (d) Copper ()
19. The primary purpose of a lubricant is to:
- (a) Increase friction ()
 - (b) Reduce friction and wear** ()
 - (c) Increase corrosion ()
 - (d) Absorb moisture ()
20. A joint sealant is mainly used to:
- (a) Carry structural loads ()
 - (b) Prevent the entry of air and water while accommodating movement** ()
 - (c) Increase the compressive strength of concrete ()
 - (d) Replace reinforcement at joints ()
21. A higher fineness modulus of sand generally indicates that the sand is:
- (a) Finer ()
 - (b) Coarser** ()
 - (c) More porous ()
 - (d) More chemically reactive ()
22. In normal timber, dimensional shrinkage is generally greatest in the:
- (a) Longitudinal direction ()
 - (b) Radial direction ()
 - (c) Tangential direction** ()
 - (d) Direction of applied load only ()

23. Blistering of a paint coating is most commonly associated with:
- (a) **Entrapped moisture or air beneath the paint film** ()
 - (b) Excessive polishing of the surface ()
 - (c) Low density of steel ()
 - (d) Insufficient aggregate crushing strength ()
24. Gypsum is added during the manufacture of Portland cement primarily to:
- (a) Increase the quantity of lime ()
 - (b) **Control the rapid hydration of C₃A and prevent flash setting** ()
 - (c) Increase the aggregate size ()
 - (d) Eliminate C, S from cement ()
25. Alkali-silica reaction in concrete occurs when reactive silica in aggregates reacts with cement alkalis in the presence of:
- (a) Carbon dioxide only ()
 - (b) **Moisture** ()
 - (c) Sulphur only ()
 - (d) Dry air ()

SOIL MECHANICS AND FOUNDATION ENGINEER - 50 MARKS

26. Soil formed by the weathering of rock and remaining at its place of formation is called:
- (a) Transported soil ()
 - (b) **Residual soil** ()
 - (c) Alluvial soil ()
 - (d) Marine soil ()
27. Soil transported and deposited by rivers is known as:
- (a) Aeolian soil ()
 - (b) Glacial soil ()
 - (c) **Alluvial soil** ()
 - (d) Colluvial soil ()
28. The ratio of the volume of voids to the total volume of soil is called:
- (a) Void ratio ()
 - (b) **Porosity** ()
 - (c) Degree of saturation ()
 - (d) Water content ()
29. The ratio of the volume of voids to the volume of solids is known as:
- (a) Viscosity ()
 - (b) **Void ratio** ()
 - (c) Air content ()
 - (d) Specific gravity ()

30. The degree of saturation of a completely dry soil is:
- (a) **0%** ()
 - (b) 50% ()
 - (c) 75% ()
 - (d) 100% ()
31. Water content of soil is defined as the ratio of the mass of water to the:
- (a) Total mass of soil ()
 - (b) Mass of air ()
 - (c) **Mass of dry soil solids** ()
 - (d) Volume of voids ()
32. The specific gravity of soil solids is generally determined using a:
- (a) Permeameter ()
 - (b) **Pycnometer** ()
 - (c) Casagrande apparatus ()
 - (d) Proctor mould ()
33. The unit weight of soil in its natural condition is called:
- (a) Dry unit weight ()
 - (b) Submerged unit weight ()
 - (c) **Bulk unit weight** ()
 - (d) Unit weight of water ()
34. Sieve analysis is generally used for determining the particle-size distribution of:
- (a) **Coarse-grained soils** ()
 - (b) Fine-grained soils only ()
 - (c) Organic soils ()
 - (d) Peat soils ()
35. Hydrometer analysis is used primarily for:
- (a) Gravel particles ()
 - (b) Sand particles only ()
 - (c) **Fine-grained soils** ()
 - (d) Boulder-sized particles ()
36. The liquid limit is the water content at which soil changes from the:
- (a) Solid state to semisolid state ()
 - (b) Semisolid state to plastic state ()
 - (c) **Plastic state to liquid state** ()
 - (d) Dry state to saturated state ()
37. The plasticity index of soil is equal to:
- (a) Liquid limit + plastic limit ()
 - (b) **Liquid limit - plastic limit** ()
 - (c) Plastic limit - shrinkage limit ()
 - (d) Liquid limit - shrinkage limit ()

38. The plastic limit is determined by rolling the soil into threads of approximately:
- (a) 1 mm diameter ()
 - (b) 3 mm diameter** ()
 - (c) 6 mm diameter ()
 - (d) 10 mm diameter ()
39. According to the IS soil classification system, the symbol “GW” represents:
- (a) Well-graded gravel** ()
 - (b) Poorly graded gravel ()
 - (c) Well-graded sand ()
 - (d) Inorganic clay ()
40. According to the IS soil classification system, the symbol “CL” represents:
- (a) Low-compressibility inorganic clay** ()
 - (b) High-compressibility inorganic clay ()
 - (c) Low-compressibility silt ()
 - (d) Organic clay ()
41. The property of soil that permits water to flow through it is called:
- (a) Compressibility ()
 - (b) Plasticity ()
 - (c) Permeability** ()
 - (d) Cohesion ()
42. The constant-head permeability test is most suitable for:
- (a) Clay ()
 - (b) Silt ()
 - (c) Coarse-grained soil** ()
 - (d) Peat ()
43. The falling-head permeability test is generally suitable for:
- (a) Gravel ()
 - (b) Fine-grained soil** ()
 - (c) Boulder deposits ()
 - (d) Rock fragments ()
44. According to the Mohr-Coulomb criterion, the shear strength of soil depends on cohesion and:
- (a) Porosity ()
 - (b) Friction angle** ()
 - (c) Water content only ()
 - (d) Specific gravity only ()
45. The vane shear test is mainly used to determine the shear strength of:
- (a) Dense sand ()
 - (b) Gravel ()
 - (c) Soft cohesive soil** ()
 - (d) Rock ()

46. The direct shear test is particularly suitable for testing:
- (a) **Cohesionless soil** ()
 - (b) Organic soil only ()
 - (c) Highly expansive clay only ()
 - (d) Rock cores ()
47. Soil compaction generally results in:
- (a) An increase in air voids ()
 - (b) A decrease in dry density ()
 - (c) **An increase in dry density** ()
 - (d) An increase in soil organic matter ()
48. The water content corresponding to the maximum dry density is called:
- (a) Liquid limit ()
 - (b) **Optimum moisture content** ()
 - (c) Plastic limit ()
 - (d) Shrinkage limit ()
49. Passive earth pressure develops when a retaining wall moves:
- (a) Away from the backfill ()
 - (b) **Towards the backfill** ()
 - (c) Vertically upward ()
 - (d) Without any displacement ()
50. The net ultimate bearing capacity of a foundation is equal to:
- (a) Gross ultimate bearing capacity plus overburden pressure ()
 - (b) **Gross ultimate bearing capacity minus overburden pressure** ()
 - (c) Safe bearing capacity multiplied by the factor of safety ()
 - (d) Allowable bearing pressure minus settlement pressure ()

HYDROLOGY AND RAIN WATER HARVESTING - 50 MARKS

51. The hydrological cycle is the continuous movement of water between the earth and the:
- (a) Core of the earth ()
 - (b) **Atmosphere** ()
 - (c) Rock mantle ()
 - (d) Sea floor only ()
52. A simplified water-budget equation for a catchment is:
- (a) $P + R = ET + \Delta S$ ()
 - (b) $P = R - ET - \Delta S$ ()
 - (c) **$P = R + ET + \Delta S$** ()
 - (d) $P = R \times ET \times \Delta S$ ()

53. Which of the following is a form of precipitation?
- (a) **Rain** ()
 - (b) Infiltration ()
 - (c) Evaporation ()
 - (d) Transpiration ()
54. The instrument used to measure rainfall depth is called a:
- (a) Current meter ()
 - (b) Piezometer ()
 - (c) Evaporation pan ()
 - (d) **Rain gauge** ()
55. Which of the following is normally considered a loss from precipitation before direct runoff occurs?
- (a) Streamflow ()
 - (b) **Infiltration** ()
 - (c) Channel storage only ()
 - (d) Groundwater pumping ()
56. The portion of precipitation that flows over the land surface and reaches a stream is called:
- (a) Evaporation ()
 - (b) Condensation ()
 - (c) **Runoff** ()
 - (d) Interception ()
57. A graph showing stream discharge versus time at a specified location is called a:
- (a) **Hydrograph** ()
 - (b) Hyetograph ()
 - (c) Mass curve ()
 - (d) Flow net ()
58. The groundwater contribution that sustains streamflow during rainless periods is known as:
- (a) Peak runoff ()
 - (b) Direct runoff ()
 - (c) Interception loss ()
 - (d) **Base flow** ()
59. If the average velocity of a stream is V and its cross-sectional area is A , its discharge Q is:
- (a) $Q = V/A$ ()
 - (b) **$Q = A \times V$** ()
 - (c) $Q = A + V$ ()
 - (d) $Q = A/V^2$ ()
60. The dependable quantity of water available from a stream or reservoir over a specified period is called its:
- (a) Porosity ()
 - (b) Drawdown ()
 - (c) **Yield** ()
 - (d) Infiltration index ()

61. A prolonged period of abnormally low precipitation that causes water shortage is called:
- (a) **Drought** ()
 - (b) Flood routing ()
 - (c) Recharge ()
 - (d) Condensation ()
62. Which of the following is a surface-water resource?
- (a) Confined aquifer ()
 - (b) Water table ()
 - (c) Borewell ()
 - (d) **Reservoir** ()
63. Groundwater is water that occurs mainly:
- (a) Only in rivers ()
 - (b) **Below the ground surface in soil and rock voids** ()
 - (c) Only in clouds ()
 - (d) Above the water table ()
64. A geological formation that can store and transmit usable quantities of groundwater is called an:
- (a) **Aquifer** ()
 - (b) Aquiclude ()
 - (c) Aquifuge ()
 - (d) Impervious barrier ()
65. Porosity is the ratio of the volume of voids to the:
- (a) Volume of solids only ()
 - (b) Volume of water only ()
 - (c) **Total volume of the material** ()
 - (d) Volume of air only ()
66. The ability of soil or rock to transmit water through connected voids is called:
- (a) Specific retention ()
 - (b) **Permeability** ()
 - (c) Capillarity ()
 - (d) Compressibility ()
67. The upper boundary of an unconfined aquifer is the:
- (a) Impervious layer ()
 - (b) Piezometric head only ()
 - (c) Ground surface ()
 - (d) **Water table** ()
68. An aquifer bounded above and below by relatively impermeable layers is called a:
- (a) Perched aquifer ()
 - (b) **Confined aquifer** ()
 - (c) Unconfined aquifer ()
 - (d) Dry aquifer ()

69. The lowering of the water level in a well during pumping is called:

- (a) **Drawdown** ()
- (b) Recharge ()
- (c) Specific yield ()
- (d) Capillary rise ()

70. The specific capacity of a well is defined as:

- (a) Drawdown divided by discharge ()
- (b) Aquifer thickness divided by porosity ()
- (c) **Discharge divided by drawdown** ()
- (d) Rainfall divided by runoff ()

71. In a rainwater-harvesting system, a dry well is commonly used to:

- (a) Measure rainfall intensity ()
- (b) **Recharge groundwater** ()
- (c) Store drinking water above ground ()
- (d) Increase roof runoff ()

72. The main purpose of a first-flush device in rooftop rainwater harvesting is to:

- (a) Increase rainfall ()
- (b) Pump water to the roof ()
- (c) Measure roof area ()
- (d) **Divert the initially contaminated roof runoff** ()

73. A filter in a rooftop rainwater-harvesting system is primarily provided to remove:

- (a) Dissolved salts completely ()
- (b) All microorganisms without disinfection ()
- (c) **Suspended matter and debris** ()
- (d) The stored water itself ()

74. Which treatment method is commonly used to disinfect stored rainwater?

- (a) **Chlorination** ()
- (b) Screening alone ()
- (c) Sedimentation alone ()
- (d) Aeration alone ()

75. A catchment receives 1,100 mm of rainfall. Runoff is 350 mm and evapotranspiration is 600 mm. Assuming no other inflow or outflow, the change in storage is:

- (a) 50 mm ()
- (b) 100 mm ()
- (c) **150 mm** ()
- (d) 2,050 mm ()

PROTECTIVE WORKS, SLOPE STABILITY AND LAND - 50 MARKS

76. The primary function of a retaining wall is to:
- (a) Carry only vertical roof loads ()
 - (b) Support soil at two different ground levels** ()
 - (c) Prevent corrosion of reinforcement ()
 - (d) Increase the permeability of soil ()
77. A breast wall is generally constructed to:
- (a) Store rainwater ()
 - (b) Support a bridge deck ()
 - (c) Protect and support a cut slope** ()
 - (d) Act as a building partition ()
78. A toe wall is usually provided at the lower end of a slope to:
- (a) Prevent erosion and movement at the toe** ()
 - (b) Increase rainfall infiltration ()
 - (c) Reduce the width of a road ()
 - (d) Measure groundwater level ()
79. A crib wall is commonly formed by:
- (a) A thin sheet of glass ()
 - (b) Timber planks placed without filling ()
 - (c) Only compacted clay without structural members ()
 - (d) Interlocking cells filled with granular material** ()
80. The main purpose of a revetment wall is to:
- (a) Retain a very high vertical cut by self-weight only ()
 - (b) Protect a slope or bank surface against erosion** ()
 - (c) Measure the shear strength of soil ()
 - (d) Replace the foundation of a building ()
81. A gravity retaining wall mainly resists lateral earth pressure by its:
- (a) Roof load ()
 - (b) Water absorption ()
 - (c) Self-weight** ()
 - (d) Surface coating ()
82. A cantilever retaining wall is most commonly constructed using:
- (a) Reinforced concrete** ()
 - (b) Unreinforced glass ()
 - (c) Loose sand only ()
 - (d) Asbestos sheets ()
83. Weep holes in a retaining wall are provided to:
- (a) Increase lateral earth pressure ()
 - (b) Support reinforcement bars ()
 - (c) Prevent concrete from setting ()
 - (d) Relieve water pressure behind the wall** ()

84. A granular drainage layer behind a retaining wall helps to:
- (a) Increase pore-water pressure ()
 - (b) **Reduce hydrostatic pressure** ()
 - (c) Increase soil cohesion permanently ()
 - (d) Eliminate the need for a foundation ()
85. Active earth pressure develops when a retaining wall moves:
- (a) Towards the retained soil ()
 - (b) Only vertically upward ()
 - (c) **Away from the retained soil** ()
 - (d) Without any deformation ()
86. Passive earth pressure develops when a retaining wall moves:
- (a) **Towards the retained soil** ()
 - (b) Away from the retained soil ()
 - (c) Only vertically downward ()
 - (d) Parallel to the wall face without soil contact ()
87. A surcharge placed near the top of a retaining wall generally:
- (a) Eliminates lateral earth pressure ()
 - (b) Reduces soil unit weight to zero ()
 - (c) Prevents all wall movement ()
 - (d) **Increases lateral earth pressure** ()
88. Sliding failure of a retaining wall occurs when:
- (a) The wall becomes perfectly vertical ()
 - (b) **Horizontal driving force exceeds the available base resistance** ()
 - (c) Concrete gains compressive strength ()
 - (d) The retained soil becomes completely dry ()
89. Overturning of a retaining wall is commonly checked about the:
- (a) Top of the wall ()
 - (b) Centre of the backfill ()
 - (c) **Toe of the base** ()
 - (d) Heel drainage pipe ()
90. Excessive pressure beneath a retaining-wall base may cause:
- (a) **Bearing-capacity failure of the foundation soil** ()
 - (b) A reduction in concrete unit weight ()
 - (c) An increase in wall drainage ()
 - (d) Improved slope stability in every case ()
91. Slope movement is the movement of soil or rock primarily under the action of:
- (a) Magnetism ()
 - (b) Temperature alone ()
 - (c) Atmospheric pressure alone ()
 - (d) **Gravity** ()

92. A slope movement in which detached rock travels mainly through the air is called a:
- (a) Creep ()
 - (b) Fall** ()
 - (c) Spread ()
 - (d) Settlement ()
93. Movement of a soil or rock mass along a distinct failure surface is called a:
- (a) Fall ()
 - (b) Heave ()
 - (c) Slide** ()
 - (d) Compaction ()
94. A flow-type slope movement is characterized by:
- (a) Considerable internal deformation of the moving mass** ()
 - (b) No deformation within the moving mass ()
 - (c) Only elastic movement of a retaining wall ()
 - (d) Upward movement caused by pile driving ()
95. Very slow, gradual and often barely noticeable downslope movement is called:
- (a) Rockfall ()
 - (b) Toppling ()
 - (c) Liquefaction ()
 - (d) Creep** ()
96. A common natural trigger of landslides is:
- (a) Painting a retaining wall ()
 - (b) Prolonged or intense rainfall** ()
 - (c) Installing a handrail ()
 - (d) Reducing the slope height ()
97. Vegetation can improve shallow slope stability mainly because roots:
- (a) Eliminate gravity ()
 - (b) Make all soil impermeable ()
 - (c) Reinforce and bind the near-surface soil** ()
 - (d) Remove the need for drainage ()
98. Boreholes in a landslide investigation are mainly used to obtain information about:
- (a) Subsurface soil, rock and groundwater conditions** ()
 - (b) Traffic speed only ()
 - (c) Paint quality ()
 - (d) Air temperature inside buildings ()
99. An inclinometer is used in slope investigations to measure:
- (a) Rainfall intensity only ()
 - (b) Concrete slump ()
 - (c) Soil colour ()
 - (d) Lateral ground movement with depth** ()

100. The factor of safety of a slope is commonly defined as the ratio of:

- (a) Driving force to resisting force ()
- (b) Available resisting shear strength to mobilized driving shear stress ()**
- (c) Pore-water pressure to total stress ()
- (d) Slope height to slope length ()

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